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Dedicated to the Science, Techniques and Applications Pertaining to the Photography of All Things Which Live or Which Have Lived

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Biological Photographic Communications

The original statement of an often quoted teaching precept is: ONE SEEING IS WORTH 1000 TELLINGS. *This is the most apt version for provoking educational introspection. Since providing the personal experience of "seeing" is so often not feasible, it is the "telling" that is the art and concern of the educator. Notwithstanding the edict, telling, with visual aids, involves much more than just exposing students to vicarious seeings; even actual experience needs guidance. The way in which photographs and other illustrations are utilized in the teaching governs the outcome.* ONE GOOD TELLING IS WORTH 1000 UNORIENTED SEEINGS.

On that theme, this special issue carries how-to-use-it papers gathered at the BPA Symposium: "Photography as a Visual Complement in Biological and Medical Communication," held in Washington, March, 1957. Additional pertinent material has been included to fill out the pages.

The Symposium demonstrated that not only can the educator and the photographer get together in planning the effective spending of teacher-student hours, but also that they must. And in apprising the public, photographers can help overcome language and literary barriers.

The considerations aired were mainly in the college and post-graduate provinces and in Public Health promotion. The session revealed the thinking of experienced and articulate educators and photographers. Their efforts will not only point out how to train and educate more people with available faculties and facilities, but also indicate more stimulating and panoramic showings in classes, books and journals. The Director of Education in the small hospital should not be deterred from studying their suggestions because practicality has held representation to members of large groups. The illustration needs of his colleagues and the instruction of interns, nurses, and orderlies deserve just as much insight and quality in photography as any academic program. The factors to be weighed here can be varied in magnitude without changing in direction.

It has been demonstrated that photography can relieve the instructor from the burden of tedious review sessions. And in current courses it can enable assistants to prepare the student with the common denominator of fundamentals and make him receptive to the individual attentions of the professor. In this way the prestige of the institution can be maintained by adequate research programs uneroded by the tidal wave of teaching.

By gathering the papers in our Journal, we hope to promote a clear-minded evaluation of a full-scale photographic service. Both sides of such a program are presented, for one-half is written by leading BPA photographers and half by prominent educators and administrators. It is believed that this monograph will be helpful to teachers who want to appraise the possibilities and purposes of the numerous products of photography. It will also give photographers ideas for making their departments more efficient and wider in usefulness to their directors.

H. LOU GIBSON

(The BPA wishes to be of service in furthering these advantages. Free copies of this issue can be requested. Names and addresses of your recipients should be sent to the BPA Secretary.)

Journal of the Biological Photographic Association Vol. 25, Nos. 1 and 2 February-May, 1957

New Opportunities for Cooperation Of Photographer and Biologist

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Tidal wave of students — need for most efficient teaching aids — two novel experimental films — impact of motion pictures — controlled tests for evaluation — new biological photographic programs.

IT is common knowledge that the next two decades will see record enrollments in our colleges and universities. This is inevitable when the tidal wave of students now in elementary and secondary schools reach college age. This situation will cause acute shortages of college teachers and create unparalelled demands and opportunities for the radical improvement of college teaching. Present signs indicate that the photographer, especially the man with imagination and skill in the techniques of the moving picture, will play an important part in meeting this challenge. The reasons for this are clear. The moving picture possesses remarkable features of the highest importance for education which have never been exploited in academic circles except in a very sporadic manner. There are, of course, other fields not involving moving pictures where the photographer and the biologist also can cooperate fruitfully in making education truly educate.

To facilitate the successful cooperation of photographers and biologists in these new tasks is one of the aims of the Education Committee of the American Institute of Biological Sciences. The Institute itself is the official spokesman for the 30-odd specialized biological societies which constitute its membership and form a virtually complete spectrum covering every area of biological science. The Biological Photographic Association is an affiliate. The role of the A.I.B.S. is primarily a catalytic one. Through its various committees, it makes studies, formulates reports and recommendations, and sponsor projects — especially experimental approaches seeking answers to current problems.

An Experiment

In the field of education and photography, the A.I.B.S. is sponsoring two experimental films for use in teaching biology to college freshmen. The funds, about $50,000, will come from a National Science Foundation Grant.

The first objective of these two experimental films is to explore the extent to which motion pictures can substitute for college and university lectures, particularly in the large introductory courses. If this can be done, even to a rather limited extent, the result will be a significant alleviation of the shortage in trained college teachers.

The second objective is revolutionary. It is no less than an attempt to render

obsolete the routine daily lecture of the conventional college course. In its place would be a film which in scientific authority, in range, and quality of material presented, and in lasting teaching impact would achieve a level of effectiveness unattainable by any single college professor. No one supposes that such teaching films will render the college professor himself obsolete any more than did the invention of printing. The professor will be freed to make more effective those lectures which he does truly need to give. Perhaps even more important, he will be able to devote increased time for that most difficult of all teaching: profitable discussion and the guidance of individual work. The A.I.B.S. does not guarantee the success of these films or the validity of any of the aims and assumptions on which they are to be made. Rather, it recognizes an urgent need and has offered its services in helping set up an experiment in the best possible way.

The director in the production of the two films will be H. Burr Roney, Ph.D., Professor of Biology at the University of Houston. Through a T.V. station owned and operated by the University of Houston, Dr. Roney has taught more students by television over a longer period of time than any other person. The staff at the University of Houston has conducted carefully controlled statistical comparisons of the attainment of students who attended more or less conventional lectures on the campus and the attainment of those who received the material over television at home. The television program was overwhelmingly more popular; students enjoying it learned at least as much as their classmates attending lectures.

A number of guiding principles was worked out together by the director and the Education Committee of the A.I.B.S.

Approach

Each of these experimental films should be specifically tailored in content, manner of approach, and timing for beginning college courses. Many of the films now available are too generalized or else too trivial and narrowly specialized. They fail to emphasize the aspects of a subject which are really pertinent at the college level. They are often of an inconvenient length. These new A.I.B.S. sponsored films will run for 45 minutes to fit conveniently into the common 50 minute college hour. They will be aimed directly at college students, not the general public. It is no doubt appropriate for Shakespeare and Walt Disney to write for all ages and all levels of intelligence and knowledge simultaneously. These films will have a more restricted aim.

The experimental films should attempt to exploit to the full possibilities of moving pictures by using both color and pre-planned sound. They should not merely try to duplicate the informal discussions of a professor. Photography can overcome time and space in a way no lecturer can. Perhaps we cannot expect a film on the theory of organic evolution to begin with a brief simulated interview with Charles Darwin as he steps off the *Beagle*, but many exciting and truly educational possibilities do present themselves. The contrasts and relationships between the animals and plants of the Galapagos Islands off the west coast of South America and the Cape Verde Islands off the west coast of Africa, played a notable part in supporting Darwin's theory. A film could provide an unforgettable glimpse of these remarkable places. Photography can afford to utilize elaborate displays

and demonstrations that would be expensive in time and money to stage in the classroom, because the same film can be used repeatedly. Photography can reveal details in close-ups of either microscopic structures or common objects in a way no lecturer can to a large class. A film can recapitulate in a few minutes events which required hours or even days. In brief, it was agreed that in addition to the clear and logical exposition of the subject, these films should place some emphasis on doing those things which the local lecturer, who is necessarily limited in time, space, and experience as well as resources, can not do. This is of course the area where the synthesis of the special skills and imagination of photographer and biologist are of paramount importance.

It was agreed that for conducting this experiment two important themes be chosen. Both should be ones that are commonly presented in freshman biology. It was also agreed that one should be on a highly factual topic and one on a theoretical subject. Meiosis was chosen for the first and the theory of evolution for the second.

Among the special advantages of a series of films is that each can be produced with the aid of the most competent scientists in any particular field; hence the series can carry an authority which no single person, no matter how eminent, could ever equal. This feature should be included in the experimental productions. It was agreed that there should be two scientific consultants to work with the director. The A.I.B.S. committee nominated biologists who are leading students of the two chosen topics and from whom the consultants will be chosen.

Finally it was agreed that controlled tests be conducted to gain some measure of the relative effectiveness of these films when used under different conditions and when compared with other methods of teaching the same subject matter. It is certainly a rare event when a biological photographer has a chance to test the effects of his efforts at communication.

Other Photographic Aims

The A.I.B.S. stands ready to assist the cooperation of photographer and biologist in any other ways it can. There have been requests that the Institute set up and maintain a clearing house and even a repository for biological photography of various kinds—moving pictures, Kodachrome slides, glossy prints etc. After considerable thought these proposals have been voted down as being altogether too vast and too costly for the A.I.B.S. to undertake. However, it is conceivable that the A.I.B.S. might lend its assistance in setting up some agency which would serve the functions of such a project if the need should prove great enough to warrant it.

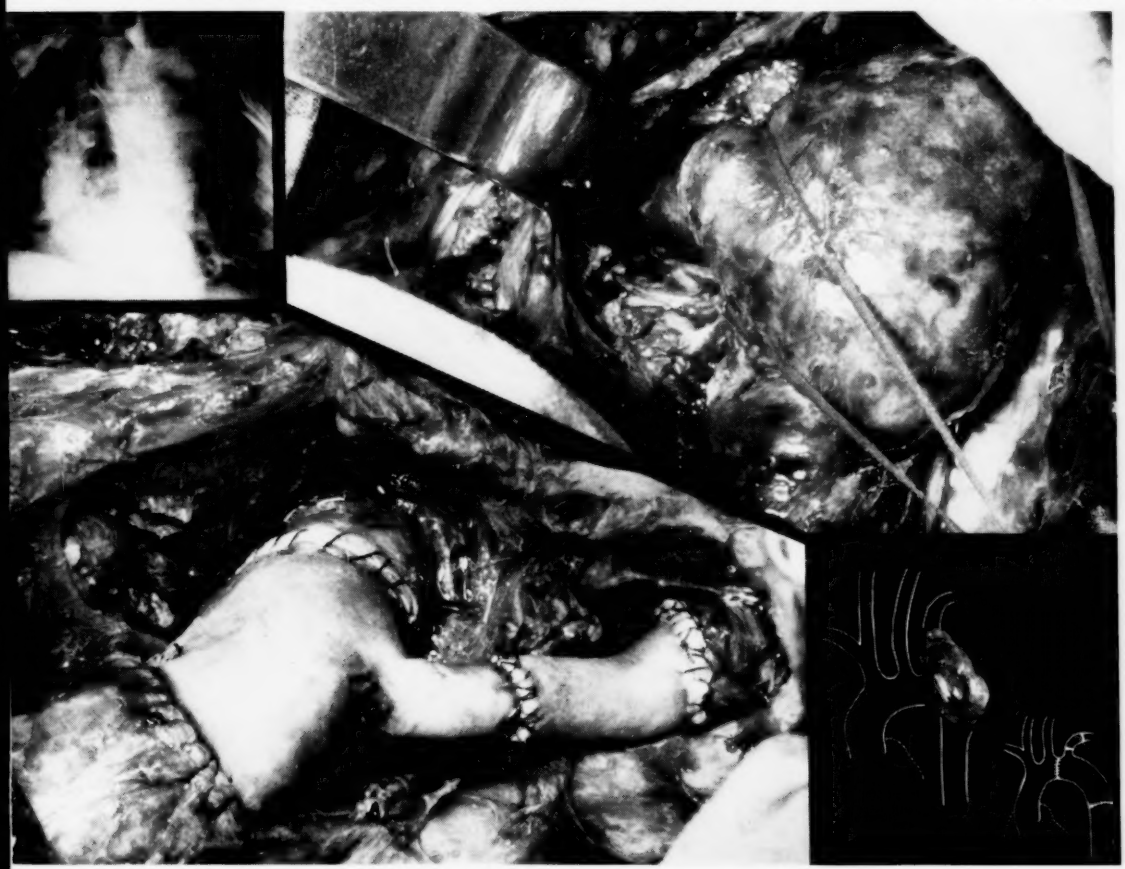
It is hoped that existing reviewing agents will increase their coverage and publish compilations and indexes from time to time. Many new film-strips of biological import are now briefly described in the *American Biology Teacher* and those relating to medicine in the *Journal of Medical Education* and the *Anatomical Record*.

Other proposed photographic programs include a biologists' calendar and a series of dramatic and informative "blow-ups" for classroom use that would highlight points where biology impinges on human life. The future is indeed rich in possibilities for the imaginative cooperation of the man who attaches his lens to a camera with the man who mounts his in a microscope.

The Emergence of a Parasitic Fly — Certificate of Merit — Douglas C. Anderson, BPA

PRINTS FROM THE 1956 ANNUAL EXHIBITION OF THE BPA

Thoracic Aortic Aneurysm and Repair — BPA Medical Education Award — Gene K. Davis, BPA



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Communication and Photography

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Communication defined — need for attuning to receiver — roles of educator and photographer — avoiding misinformation in photographs.

COMMUNICATION occurs when a message goes from one person to another and all scientific progress, indeed all civilization, depends on this exchange. Among the many means for sending messages the photograph is one of the most important in the biological sciences and the role of the photographer as a communicator is very significant. Photographers are well aware of the many concepts which are virtually impossible to transmit except by either still or motion picture photography; for example, the dynamics of mitosis.

Communication remains an art and the problems of good photography are as varied and intricate as the problems of good writing, good speaking or any other form of communication. The proficient photographer can evaluate with some degree of accuracy his technical skills and adequacy with equipment but as an artist he shares with all other communicators the responsibilities and self-analysis involved.

When a communications system such as the telephone or wireless is used its effectiveness or success is relatively easy to determine, because the message received can be compared with the message sent. If the two match perfectly the communications system is in good order. If no message is received or if it is garbled a breakdown is clearly evident; some specific failure can be traced.

Communication as we are here considering it in photography is somewhat more complicated than a telephone system. We cannot depend only on optical and chemical reliability because the receiver is now not a purely physical device but instead a complicated human being with an intangible mind. A person is much more difficult to "turn on and tune" than an electronic receiver. His body as a machine may have the eyes to see but as a human being he may not be receptive to the intended message. If he does not perceive or understand the intended meaning or significance there has been no more communication than if the photograph were a blur. When this happens in attempts at spoken or written communication it is called verbalism — the words are heard or read but they mean nothing. Fortunately, the photographer has avoided this type of aspersion but can at times be called for image slippage.

The exasperating problem is that the sender of the message, in this case the photographer, may never know that communication has broken down. The human receiver is complicated and hard to assess and the message as he receives it cannot be easily matched with the message thought to have been sent.

It is the peculiar art of the photog-

rapher to design a message on film or paper that will be picked up by some particular group of human receivers; i.e., the audience. Their receptive capacities for complex signals cannot be taken for granted; even the fact that a picture appears before their eyes is no reason to assume that they will get the message. The multitude of narrow-band messages intended for them from numerous everyday sources is cause enough for people to be very selective in the information they extract. The factors which determine what meanings they select are many and complex and include their attitudes, their ambitions, their backgrounds of knowledge and experience, their familiarity with photography and assessment of photographs.

The steps or rules for a good artist are hard to define. It goes without saying that he must be a highly skilled technician, handling with accuracy the mechanical and chemical components that go into a good photograph. Beyond this the photographer must know his audience and gauge their range of receptiveness. Further, he must define as clearly as possible the message to be transmitted and apply his skills as technician and artist in monitoring his output to the audience capacity.

The photograph is less specific and real than we are willing to admit. It can only impinge on one of the human senses — sight. It cannot reveal directly odor, weight, taste, or even texture. It demands that the audience have a good deal of background experience so that the signs or images can be related in a meaningful manner to those previous experiences. For example, three men receiving identical optical visual images of an object in the sky may call it a bird, a duck, or a mallard.

Finally, we must accept the fact that the photograph is only one of many accepted, and effective means of communication and there are certain messages that do not suggest visual communication. For example, the concept "Nowhere" defies 1000 pictures. On the other hand, many specifics of biology are natural subjects for photography and if a photograph is designed for the audience it is worth volumes more than a dictionary full of words.

Figure 1. Those with a biological or medical background only will start sorting through their mental file cards in the sections on molds and fungi when they view this subject. Actually it shows some of the characteristics of smaltite to the minerologist. A foreign concept like this cannot be illustrated with a single image — and all of biology is foreign to students in the beginning of their studies.

Content of Photographs

To reduce the discussion to some of the specific considerations beyond the technically good photographic image we can examine the content aspect. The items included must be familiar to the

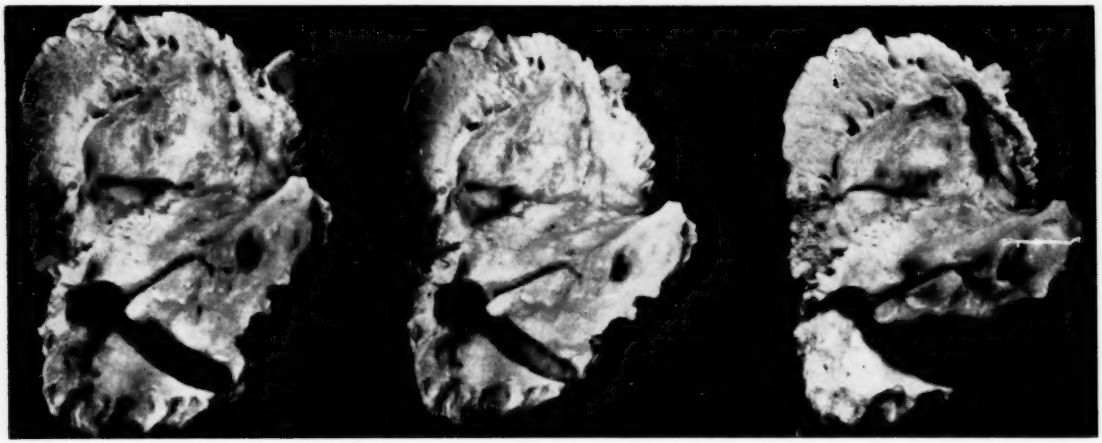


Figure 2. *Left:* the anatomist will quickly recognize the temporal bone and distinguish squamous and petrous portions and the sinus for lateral vein. Yet in spite of this being a technically good image, it is a poor teaching photograph. The separation of squamous and petrous characteristics is not possible for students. *Center:* by means of a simple tilt, the petrous portion has been made to stand out. *Right:* a slight degree of mislighting merged sinus and base of petrous portion. Technical niceties, mandatory for a clear teaching illustration, are simple to accomplish when their need is appreciated by the competent biological photographer.

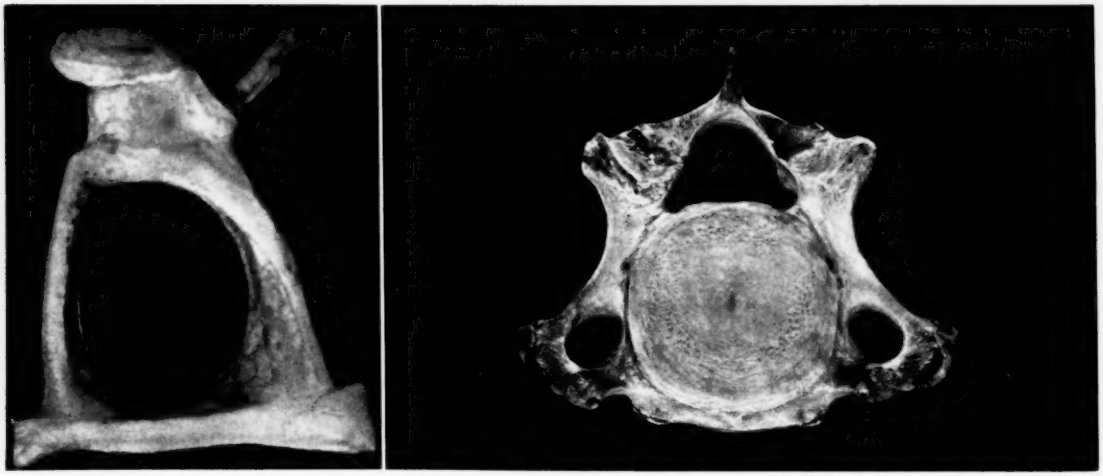
viewer, even though selected and related to tell a new story; see Figure 1.

The subject thus must be arranged and lighted so that the camera, and hence the audience, sees the key characteristics; it is not enough for the educator to see them in his mind's eye and assume that they are emphasized because they do appear in a technically clear photograph, Figure 2. Supplementary items, composition and even cropping must not be misleading, Figure 3.

Such are the communication skills demanded of the photographer. Naturally, the teacher also needs perspicuity but his responsibility lies in selecting subjects and presentation sequences. He must learn to sense when his message is getting through accurately, because meters such as tests won't give him a direct reading. He and the photographer should both consider the concepts to be transmitted and decide where and how photography should be wired into the communication system.

(The Author is grateful to H. Lou Gibson for providing photographs to illustrate some of the points made here.)

Figure 3. *Left:* this may look like an ostrich wishbone; yet it is a photomacrograph of tiny human stapes. *Right:* cervical vertebra, sperm whale. Injudicious cropping imparts false size impressions.



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Use of Photography in a Large Medical Institution

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Aid to treatment as well as teaching — varied patient records — ordinary and time-modified motion pictures — teaching home care to laymen — laboratory applications — operating-room cameras — research and technical needs — training personnel — itemized uses.

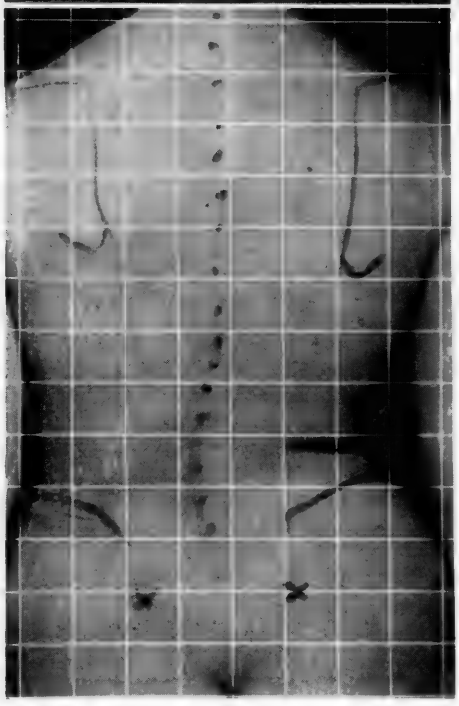
IN the modern medical institution the extent that photography is used depends on the size of the institution and the scope of its activities. In a small hospital, photography may be employed only for a few pictures taken by one of the doctors with his personal camera. A large medical center, perhaps associated with a medical school, may have a staff of professional photographers and a variety of cameras and devices.

In general, photography is used for recording, for reporting, and for teaching, but it also has a place in diagnosis, treatment, and research. The basic demand for photography in a hospital or clinic is for recording the appearance of a patient, a pathologic lesion, or specimen. The next need is for lantern slides or photographic prints for use at staff meetings or for publication in medical journals. These same pictures may be used in teaching, but usually it is necessary to have additional photographs for specific teaching situations.

Photography: Patients, Lesions

Photographs are made of patients for many reasons. The doctor may want a photograph to illustrate a rare disease or unusual condition or, on the contrary, perhaps the picture is made to show that the patient appears to be in normal health while actually he is seriously ill. A collection of selected photographs can show the medical student a greater number of similar pathologic conditions than he probably would encounter in a lifetime of medical practice, and thus aid him in recognizing disease. In some cases of disease the change for better or for worse may take place so slowly that photographs provide the best record of progress. A photograph is much better than a verbal description or a sketch in showing the character and distribution of skin lesions and some other conditions. The doctor often studies earlier photographs to determine what visible change has occurred, and this may affect his decision concerning choice of future treatment.

Sometimes a photograph can aid in making a diagnosis. For example, a photograph taken on infrared sensitive film will reveal blood vessels that are invisible under the skin and can demonstrate which vessel is obstructed. Ultraviolet rays or "black light" is used to demonstrate fluorescence in certain dis-



cases of the skin. These effects can be recorded in photographs that can be studied in ordinary light.

One of the common uses of photography in a medical institution is to make the "before-and-after" type of photograph often used in case reports. The patient who has undergone a plastic operation on the face may forget her former appearance or may have dreamed of much greater improvement in her appearance and consequently may sue the doctor for damages. In such situations a preoperative photograph of the patient is an invaluable record for the doctor. Of much commoner occurrence is the patient who is so pleased with the result that she asks for a print of her former appearance to put in her scrap book. Occasionally a patient desires a photograph or a print from an x-ray film showing a physical disability

so that he can use it when claiming compensation insurance. Some government and welfare agencies require photographs of patients, such as crippled children, whom they refer to a hospital for treatment. Some grants in aid also require that reports be supplemented with photographs.

Motion Pictures

Motion pictures are used for recording disorders or limitations of movement and for demonstrating various technical procedures. Color motion pictures are especially suited for illustrating surgical operations and for recording rapid changes in color such as the flushing and blanching that may follow the administration of drugs used in diagnosis. In some cases of disease, the patient's speech is affected, and this has been recorded on sound motion pictures. Action that is too rapid or too brief for careful observation, such as muscle twitchings, can be studied from slow-motion pictures. Contrariwise, time-lapse motion pictures made through a microscope can speed up the apparent motion of living tissue cells or parasites that normally move too slowly for observation.

Motion and still pictures supplement instructions given to patients. For example, the arthritic patient may need massage and other forms of treatment that can be given by a member of the family after receiving instruction. Motion pictures are especially good for demonstrating the technic of massage and manipulation of joints. The patient with diabetes and members of his family must learn about the disease and how to control it. To supplement personal instruction, the showing of film strips, with recorded lectures has served well when a routine discussion is to be given to each new group of patients.

Motion pitcures also may be used to improve the morale of patients. For example, a patient who is improving slowly from some disability may become discouraged until he sees his earlier condition in motion pictures which reveal that he has improved much more than he realizes. Some hospitalized patients, such as those who are recovering from the after-effects of poliomyelitis, have been provided with a photographic darkroom where they can practice photography as a hobby. Motion picture programs for entertainment have been highly popular with such patients also.

Before a new drug can be released to the medical profession, it must be thoroughly tested to make certain that it is safe and effective. Patients participating in such tests may be photographed many times to record any visible changes. For example, a large number of photographs (color, black-and-white, still and motion picture) were made when the effects of penicillin and of cortisone were being studied. These pictures supplemented reports that were published and also were presented at large medical meetings so that members of the medical profession were well informed before the drugs were made available to them.

Photographs: Specimens, Cultures

Photography plays an important role in the hospital laboratory where a surgical specimen may be photographed before and after it is cut for further study grossly and microscopically. The surgical pathologist may make his diagnosis from microscopic sections of tissue that are prepared by the quick frozen method. These sections have a short life, but they can be photographed to

provide a permanent record. Likewise, the bacteriologist may utilize photography to make a permanent record of colonies growing on culture media. The old museum filled with glass jars containing pathologic gross specimens has largely been replaced by displays and files of photographic color transparencies.

Specialized Applications

Special endoscopic cameras for making photographs within body cavities have been used to record lesions of the vocal cords, the uterine cervix, the ear drum, the rectum, the esophagus and the trachea. These cameras, both still and motion picture, are manipulated by the physician. Similarly the ophthalmologist uses a retinal camera for photographing the inside of the eye. Pictures of body cavities are especially valuable for teaching because they can be shown to large groups while usually only the physician can see the field when working on the patient. Enlarged pictures of this type have many uses.

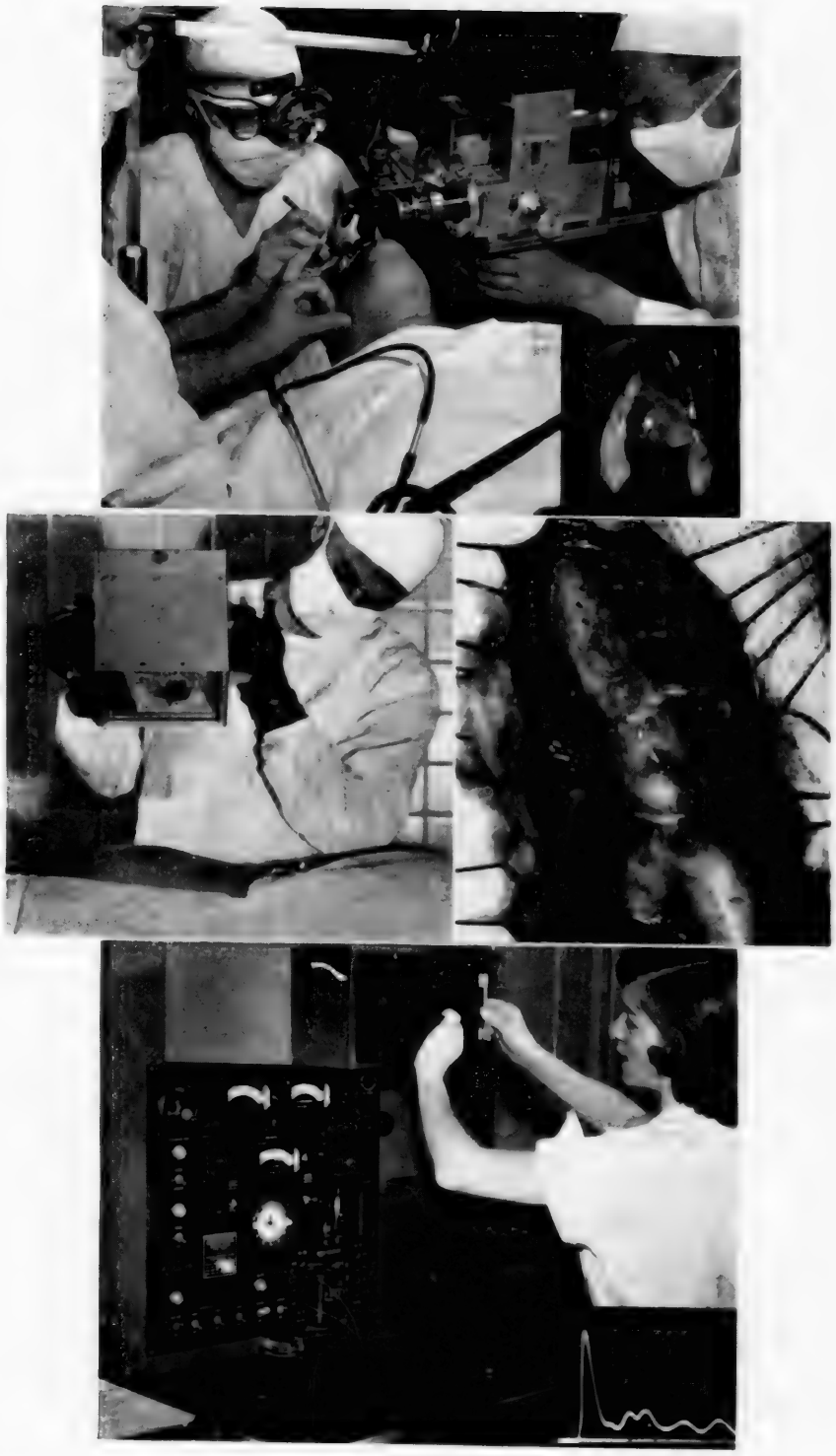
Sometimes the photographer is asked to make still or motion pictures in the operating room. However, at times the photographer is not available in emergencies and at times the surgical cavity is so deep that the area of interest cannot be recorded from a safe distance by unscrubbed personnel. At such times the surgeon can use a camera in a sterile housing directly over the operative field. These pictures can be reproduced in various ways and can be used as guides by an artist in preparing drawings or wax models.

The heart is studied by means of an electrocardiographic unit that uses a roll of photographic paper or 35-mm. film. As the paper or film moves past an aperture, it is exposed to a beam of light which is deflected by a galvanometer that is motivated by the activity of the heart. The processed records are used in diagnosis.

Patients who are to have an operation performed on the heart undergo various laboratory tests. During some tests a number of recording devices are attached to the patient; they lead to a kymographic camera in another room where beams of light are deflected by galvanometers onto a moving roll of photographic paper which may be as large as 18 inches by 200 feet. After this has been processed, it is analyzed and significant portions may be photographically copied to reduce them to a more convenient form for publication.

Somewhat similar records have been made with a pen writer in other tests, and a selected portion of each record, overlaid with a transparent gauge, has been photographed with a 1-minute camera (Polaroid) to provide a small record that is sent to the consulting physician as part of the laboratory report.

Ordinary roentgenograms are shadow pictures made on film by exposure to x-rays without a camera. If such films are to be reproduced as slides or prints, the films are copied with an ordinary copying camera. Incidentally, when making mass surveys such as x-ray pictures of the chests of all students in a university, the high cost of large films (14 by 17 inches) is avoided by using a small camera (4 by 5 inches or 35 mm.) to photograph the fluoroscopic screen. Any abnormal conditions found on examination of the small films can be verified by making roentgenograms of standard size of the patient. X-ray motion pictures also can be made under limited conditions by photographing the fluoroscopic screen or by means of an image intensifier.



A research project involving the microscopic study of the circulation in bone has used x-ray diffraction equipment to produce contact microradiograms of sections of bone. These pictures are made on special high resolution photographic plates. The processed plates have such fine structure that they can be magnified more than 300 diameters in a microscope to produce photomicrographs that are possible in no other manner. This method permits microscopic study of structure and the measurement of opacity of individual cells.

Oscilloscopes have a number of uses in the laboratory, and a variety of recording cameras are used to photograph the pattern on the oscilloscope screen. Another kind of recording device is the electrophoresis camera that produces a photographic record of differences in diffraction of solutions of blood proteins.

In the study of disease of the thyroid gland, the patient is given radioactive iodine which tends to localize in the thyroid gland. After the diseased gland is removed, sections are cut for microscopic study. The radioactive tracers in the tissue are invisible so that a section of thyroid tissue is placed in contact with a photographic film and left in the dark for about 16 hours. The film is affected locally by the radioactivity so that when the processed film is superimposed on the stained section of tissue one can see which cells contain the radioactive iodine. Instead of using a separate film one can coat photographic emulsion onto the section of tissue.

In a related laboratory test a solution of radioactive thyroid extract is analyzed by paper chromatography. For this test the solution travels by capillary action up a suspended strip of blotting paper. The various ingredients have different rates of travel and come to stop in bands at different distances. These can be identified by comparison with standard references. The radioactivity of the various bands can be measured by a Geiger counter but it also may record unwanted background noise. A more critical record is provided by autoradiography where the dry paper strip is placed in contact with a sheet of photographic film. After the necessary time of exposure the film is processed and superimposed on the paper strip. Thus the film with its visible areas of density aids in making the analysis.

Photography serves to protect the laboratory personnel who are working with or near radioactive material and who may be exposed to harmful amounts of the powerful rays. In order to guard against excessive exposure, the workers wear badges that contain photographic

film and identification data. The films are developed at selected intervals to determine whether there is any fogging

from excessive exposure to radioactivity.

Photographic copying is an important activity in the hospital and clinic. Copies are made of illustrations in textbooks, of charts, of tabular material, and of drawings and graphs made by the art department. These are used for publication and for teaching.

A 35-mm. microfilming camera is used to make copies of selected x-ray films and other records that are wanted in small form for compact storage. Similarly a 16-mm. camera is used to photograph all checks and money orders that are received by the business office.

Various photocopying processes that do not use film serve in a number of ways. The correspondence department has a small unit that can be used in ordinary light for quickly making inexpensive reflex copies of correspondence. The medical library has a different unit that accepts bound volumes and produces a reversed paper negative from which a positive print is made. A different process (diazo) serves in another area for making contact copies of translucent material such as manuscripts typed on thin paper and shop drawings.

A camera using a dry electrical process (xerography) serves in the production of various instruction booklets and the numerous printed institutional forms.

A large photocopying camera (photostat) is used for copying various records that are to be notarized, such as records that are required by various medical boards. It also is used in preparing large copy that is used in exhibits for display at medical meetings.

Additional Uses

In addition to these many specialized applications ordinary photography is needed in a medical institution. Identification photographs may be made of each new employee while more formal portraits are needed of each doctor that is on the staff. When a doctor is to speak at a medical meeting, he often is asked to provide a portrait print for the program. He also may need prints for various specialty boards or for use on the occasions when the press and television stations request them.

Surgical operations require the use of a large number and variety of instruments and supplies which are arranged differently for each kind of operation. Printed lists itemize what is needed, but photographs serve as guides for the arrangement. Similar reference photographs are used in the research laboratory when experiments involving elaborate setups are being repeated.

In every large medical center there is a continuous teaching program and photography, being one of the most important of visual aids, is widely used. Student nurses and new technicians must be trained, and new methods must be learned and procedures standardized. Hundreds of photographs have been used in training x-ray technicians how to place the patient and equipment in precise positions to obtain roentgenograms that have diagnostic value. Animated sound motion pictures are used in teaching technical subjects, such as the principles of electronics and radioactivity. Motion pictures of surgical procedures are shown to student nurses before they start working in the operating rooms so that they can assist more efficiently.

It is common practice for members of a hospital staff to hold meetings at which they discuss various cases, report postmortem findings, and hear the results of research projects. At these meetings, it is customary to use lantern slides that have been made from photographs,

from typewritten tables and case records, and from hand-drawn graphs. Also on the program may be motion pictures from film libraries.

Many general activities in the hospital have timely interest and are photographed for use in public relations and for historical purposes. One of the most valuable aspects of photographs is that they so often become more valuable with the passage of time because in early photographs will be found pictures of lesions rarely seen any longer, since they have been conquered by the advance of medicine; and as medicine advances it will find new applications.

Summary

Photography is used to record various conditions and things, to provide collections of rare cases, to serve as comparison records of progress and for possible medico-legal purposes. It also is used to provide permanent records of things that have short life or quickly change form.

Photography records the invisible by means of infra-red and ultra-violet light, x-rays and autoradiography. Contrast may be exaggerated by selective use of filters and films. Motion pictures provide not only a record of action but can also prolong time or compress it.

What can be seen by only one person can be shared with thousands by means of endoscopic photography. Many laboratory procedures rely on photography to provide sensitive records that are used in diagnosis, analysis and research. Photocopying methods are used to save time, space and money; and nearly all of the above are used in some way in teaching, in public relations and for historical records.

YOU MAY WANT TO READ

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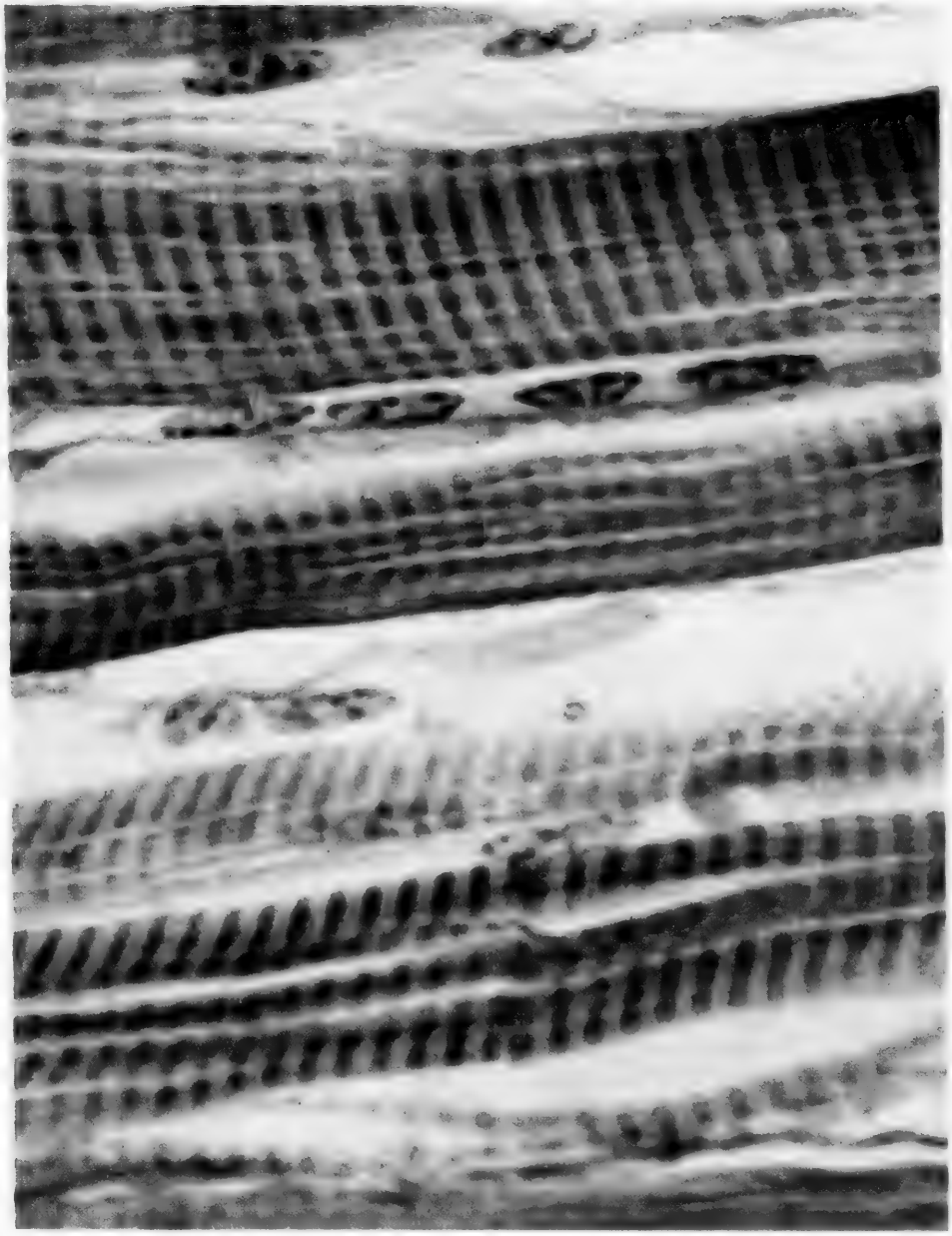

Plate I. A large part of the work of any biological photographic department is photomicrography. Useful results call for good equipment, technical skill and judicious selection of specimens and fields. This illustration depicts normal striated muscle from the human diaphragm, × 1650. The tissue was stained with Goldner's modification of Masson's trichrome stain. Made by John J. Beiter, FBPA for Milton G. Bohrod, M.D., School of Medical Photography, Pathology Laboratories, Rochester General Hospital, Rochester, New York.

Journal of the Biological Photographic Association Vol. 25, Nos. 1 and 2 February-May, 1957

Correlation of Films and Textbooks

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McGraw-Hill Book Company Incorporated

Motion pictures used early — capabilities and incapabilities — student attitudes — teachers' manuals — photographic aids and textbooks as units.

THE remarkable success with training films achieved during World War II by the military and industry and the resultant publicity, convinced the average citizen that the use of audio-visual materials for instructional purposes was something more than just a fad. Furthermore, it is now readily accepted by educators as well as by the trainees and the public, and the motion picture's application to education is real, effective, and well worth the cost in time and money.

However, under the stimulation of this justified enthusiasm there have developed many exaggerated statements and claims as to what audio-visual materials are and what they can do. For example, many thought the training film as used during World War II was something new — a new development in education. Others thought that there was no more need to use teachers; that the motion pictures could do the training job alone. Still others felt that motion pictures could do the complete job and that no other educational materials were needed. Finally, many of them said that the training films could be used to teach all conceivable subjects.

Actually, although each of these statements may have some factual basis, none is completely true. Audio-visual materials in one form or other have been used as aids to education for centuries. The earliest instructor in Greece or Rome, taking his students around the city and pointing out concrete examples of things that they had discussed in the lyceum, was using a form of visual education. The time-honored blackboard is commonly used for visual presentations. And the demonstration of processes or techniques is still another form of visual aid.

Even motion pictures are visual aids of long standing, although it is true that their extensive use for teaching purposes had never been so fully developed prior to this war. The first motion pictures were made in the late eighteen hundreds when somebody wanted to know about the movements of a galloping horse and succeeded in capturing these movements in sequential still pictures. If by educational motion pictures we mean informative motion pictures, then this first one on body movements of horses was an educational motion picture, although the photographer was probably completely unaware that he had started a new technique in education.

In the 1920's and 1930's the first of the truly educational motion pictures developed. The Yale Chronicles, The Eastman Teaching Films, and the ERPI Productions were all planned as educa-

tional motion pictures. Organizations to produce these films pioneered the early motion pictures from a truly scientific and educational standpoint. They examined the curriculum, discussed the problems with leading educational authorities, and then developed motion pictures that were to be used for teaching purposes. Under the guidance of competent educational consultants they combined good pedagogical methods with what was then good motion picture production technique, and produced many good educational films. Many of these early motion pictures are still widely used today.

So teachers and educators have been using motion pictures for some years, but not widely. It still took the war period to bring about their best use. With unlimited funds and advice from top-flight educators, the military developed an excellent audio-visual program for the armed forces. The investment was considered well made because it was a matter of life and death. If education had had the funds and resources that were available to the military forces, probably they too could have developed a comparable audio-visual program before the war.

However, up to 1941 this had not been done, and hence it remained for the Army, Navy, and U. S. Office of Education to make the first large-scale use of audio-visual materials.

Evaluation of Progress

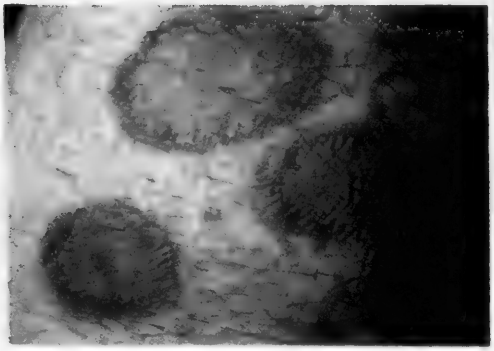
The resulting programs provided a good opportunity to experiment with techniques of both production and utilization of audio-visual materials. Consequently, a great deal of valuable data were accumulated on the instructional effectiveness of the motion picture, and some false claims were thrown out. For example, it was found that in many instances other training devices were more effective than motion pictures. Furthermore, the exaggerated claims about motion pictures doing a complete job by themselves were also incorrect. They still had to be used properly and by a qualified teacher, and there were specific techniques of preparation and follow-up that increased the value of the screening of the picture.

Experience showed that teachers generally needed advice and guidance in using films, and this kind of help could best be supplied in the form of teachers' manuals, to go with the films. And finally, no matter how complete the film, it was demonstrated that supplementary written material was needed. In other words, the film supplements but does not replace the work of both the teacher and the textbook.

When used properly, there was plentiful evidence of the amazing effectiveness of the film in every area of education—industrial, military, and professional. It was found, for example, that information learned through the educational film was not only grasped more quickly, but retained longer than when learned through the conventional methods of classroom instruction. Furthermore, the film was found to be a powerful agent for motivating and stimulating interest, and allied to this capacity is the power of the motion picture to develop attitudes and to mold opinions in classroom and theatre.

Perhaps of all the government training programs developed during the war, the one sponsored by the U. S. Office of Education contained the greatest elements of general education. A more detailed examination of this program may, therefore, reveal several principles which can be applied to school and col-

Continued on page 22



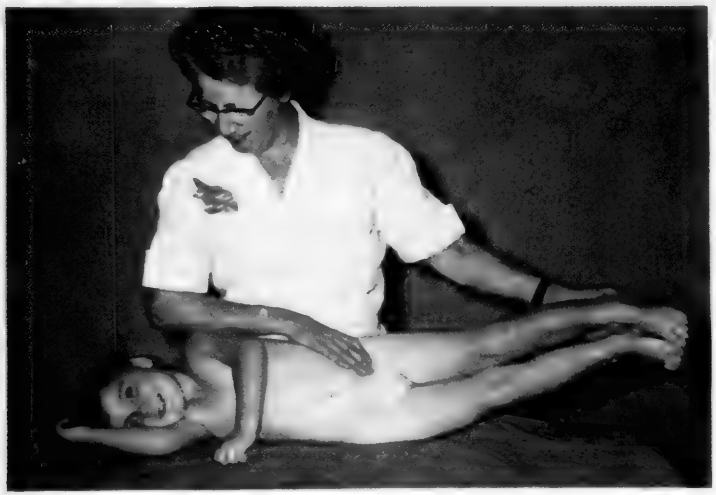


Plate II. Laboratory and field subjects photographed with a simple miniature camera and single-flash exposure for quickness, convenience and independence upon existing lighting conditions or facilities.

lege use of these audio-visual materials.

The program of the Office Education was unique in that it began combining many ideas that had developed for a number of years from several sources. For example, instead of single films a series of films were used, each treating a part of the subject. Thus the films fitted well into a continuous film program throughout a given course. The USOE also adopted the teachers' manual, designed as a useful source of information and help to the instructor employing the films.

Theoretically, the success that teaching films met during the war should have made them a "must" for education in all schools and colleges. Yet this is not the case. Part of the reason for the slow adoption of audio-visual programs for general education has been the lack of sufficient equipment and facilities for projecting films in our schools; part has been the absence of sufficient films, or the deficiencies in specific existing films. General unfamiliarity with the medium and its capacities for teaching have also been holding back progress. But perhaps one of the most serious blocks to the full-scale use of films in schools has been the difficulty many teachers have in coordinating the use of the film with the other instructional materials.

A Publishing Program

We at McGraw-Hill felt if we could make educational motion pictures, and filmstrips too, directly correlated with specific textbooks we would overcome many of these difficulties and perhaps widen the use of photographic aids in the classes. We first decided that the function of the motion picture in our program would be to dramatize and give realistic explanations of theories, principles, techniques and applications. We would use animated drawing, photomicrography, and slow-motion photography if it would help the student visualize what is normally difficult or impossible to see. We would take sequences of a part of the textbook and further amplify it, going far beyond the textbook and thus provide the teacher with material that would be helpful in teaching the course.

Furthermore, we decided that we could get educational authenticity by having the author of the textbook act as consultant during the filming of the motion pictures. The author, in addition to being an authority on the subject, is also actively teaching the course about which the book is written. We therefore have technical experience and actual teaching experience to draw upon. In addition, the way in which the book is written will often govern the roles that text and film are to play. Another point of correlation is the use of stills from the motion pictures or filmstrips to illustrate the book. With this approach and with selectivity in fields lending themselves to this treatment we have already produced several successful combinations.

Where words are powerless, motion pictures can amplify information and put it into pictures. It can take difficult conceptions and show them on the screen in ways that words would have a great deal of difficulty in describing. There is no assumption that the motion picture or the filmstrip or the textbook alone will do the best training job. Each has its own function, the textbook for individual study, the motion picture and filmstrip for group study.

These are all instructional tools, and they must be correlated for the most effective use by the instructor. The

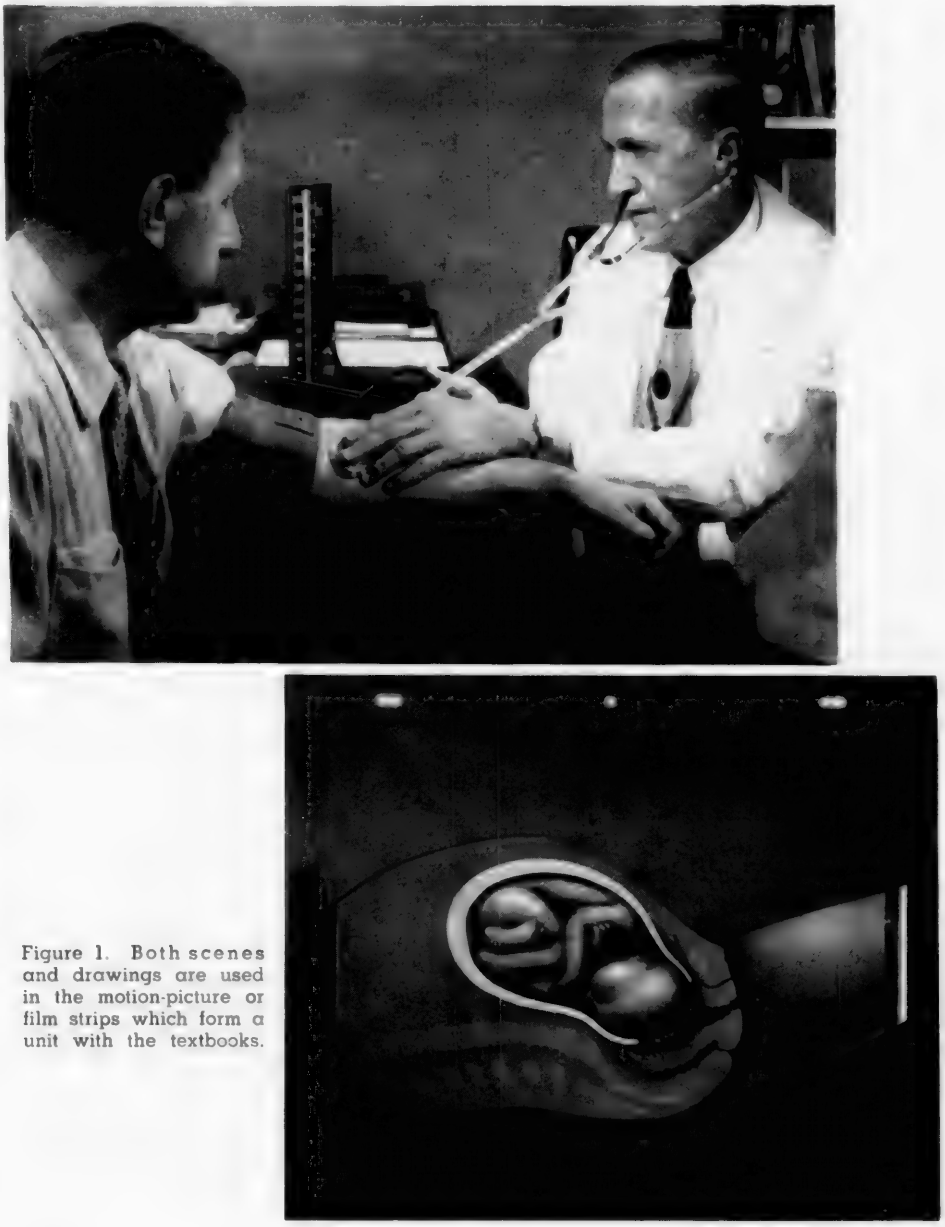
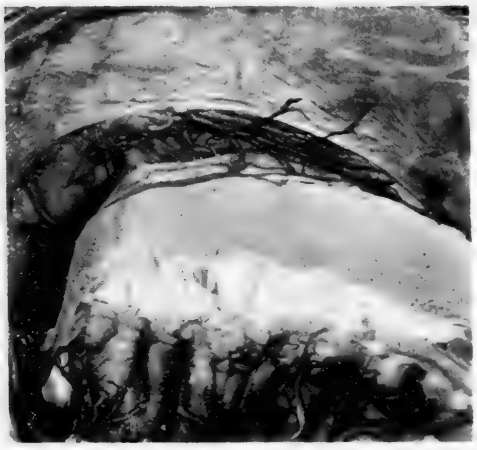


Figure 1. Both scenes and drawings are used in the motion-picture or film strips which form a unit with the textbooks.

success of the training job done with these tools depends upon the skill of the instructor using them. The aids alone will not do the job any more than machines alone can build airplanes—but they will help to do a good educational job as a combined unit. Together they should make a contribution of lasting importance, not only for visual education but for education in general.



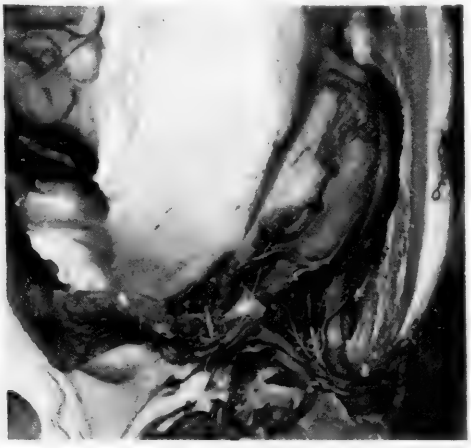


Figure 1. Two-dimensional views showing dissections from part of the central nervous system. These were reproduced from single frames in a stereoscopic reel and show the serial nature of the prosection.

Figure 2. A stereo pair from the reel in Figure 1. Viewing stereoscopically will reveal the importance of space relationships in such studies. The optic nerve, chiasm and tract, and the lateral geniculate body are depicted.

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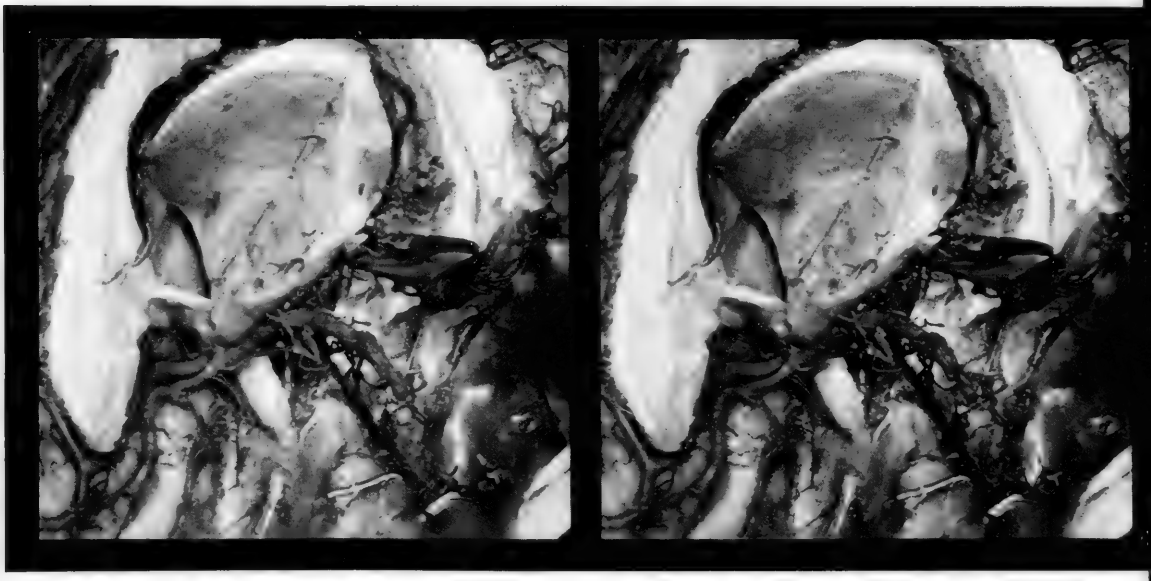

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The Place of Three-Dimensional Illustration Accompanying Medical Texts

GEORGE H. PATTON

Merchandising Manager, Sawyer's Incorporated

Photo-text combinations — basis for stereoscopic reality — intangible relationships — function of the Atlas — past applications — format described and illustrated.

WHILE the author cannot bring to this group of skilled technicians a contribution to the varied techniques of biological photography, he can offer some first-hand experience in the usefulness of stereophotography as an aid in imparting complex information. He is associated with the selling profession, in which the major objective is to present the facts about a product, a service, or an idea so faithfully that the customer can easily appraise its value to himself. Therefore, the superior ability of three-dimension photography to communicate difficult technical concepts makes him intensely enthusiastic.

The discussion is based largely upon experience in manufacturing and distributing of "A Stereoscopic Atlas of Human Anatomy". Nevertheless similar combinations of text and stereophotographs in the medical specialities are available and some in the botanical field. The general advantages presented can be extended to other scientific subjects.

For the first time in the history of medicine, the human anatomy appears to be undergoing significant changes!

That statement is quoted, in substance, from several of the many enthusiastic letters continually received at our offices. These letters concern the Atlas and come from medical schools, practitioners, and even students. The key to the significance of this is contained in the word "appears". When you have seen the demonstration by three-dimension projection of the differences between flat and stereo illustrations of the same typical anatomy, we think you will fully appreciate what that statement is trying to say. Not that it is easy to put into words a description of the sensations received in viewing a stereogram. In the first place, seeing is a learned art and there are varying degrees of efficiency in seeing to be found in any group of people. So the intensity of sensation in viewing three-dimensional pictures can vary also in different individuals. However, the capacities of stereo to portray any solid object in life-like realism, is apparent in some degree to any person possessed of nominal eyesight.

Have you ever tasted the exotic flavor of papaya or passion fruit? If so, have you attempted to describe that flavor to someone else? You will agree that

sensations are difficult, if not impossible to describe — especially when they are uncommon and cannot easily be compared with a similar sensation. About the only way anyone can know the flavor of papaya fruit is to taste it for himself. Stereo, too, must be experienced, particularly in direct visual comparison, to be fully appreciated.

Please recall that stereo, three dimensions, or 3-D, whichever term you prefer to use, is nothing more nor less than the re-creation of human binocular vision. In normal human vision the spatial relationship of all objects within your field of sight to yourself is clearly apparent. This is because of the capacity of your separated eyes to "triangulate" upon each object in view. It is also because of the capacity of your brain to "fuse" the independent images received by each eye into a single depth scene. Stereo photography only reproduces this binocular vision by employing those same capacities of your eyes and brain.

No doubt some, if not many, of you have attended an anatomy dissection at some time — human or other. You may even be an anatomist. If so, I wish to make plain that I am not. But I have reviewed the stereo illustrations of the Atlas enough times to be full of awe at the wonderfully complex construction of the human body. But, if you have been on hand at an anatomy dissection, you probably were part of a group. The instructor did the preparatory dissecting and each member of the group got a "hand in" for a portion, but not the whole, of the assignment. So, I ask you, were you not the best informed concerning that portion of the dissection you personally performed?

From the many letters we receive as well as from occasional personal contacts with members of the medical profession, comes the assertion that the life-like stereo illustrations of Dr. Bassett's highly skilled dissections as featured in the Atlas are the best supplement for personal performance in the study of human anatomy. Practitioners tell us that reviewing anatomy in the Atlas gives them a clearer understanding than they ever obtained in study. Medical schools advise that the Atlas is invaluable for both teaching and review because of its clarity. As an educational medium, three dimensional illustration is becoming increasingly accepted as being capable of teaching more quickly and more thoroughly. For example, at the outbreak of World War II, the United States Army and the Navy commissioned my Company to produce VIEW-MASTER three-dimension picture reels of enemy aircraft and enemy combatant surface vessels. This commission was given with the knowledge that its aircraft and submarine personnel would learn visual recognition of these subjects and their respective strength and weakness characteristics in a shorter time and with greater memory retention than possible in any other graphic medium. About two years ago we completed for the United States Public Health Service "a Stereoscopic Manual of Venereal Disease". The Service has supplied these to all accredited medical schools of the country. They report that this manual has been found to be so efficient for its purposes that they wish to enlarge the use of the medium into other fields.

A steadily increasing number of industrial and commercial enterprises are making use of the life-like quality of stereo to illustrate the presentations of their products and services. My Company is currently exploring the development of primary-grade educational texts,

illustrated by three-dimension picture reels. These may possibly be followed by texts for secondary and higher grades of public school instruction. The value of stereo in picturing the spatial structure of molecules and atoms in chemistry and nuclear physics can easily be imagined.

All such educational prospects are a natural consequence of the economical, large-quantity manufacture and distribution throughout the world of low-cost VIEW-MASTER three-dimension picture reels of scenery, nature subjects, children's stories, religious stories, world events and the like. Lacking this, the cost of such illustration in academic projects alone would be prohibitive.

The Atlas, which is not quite half completed at this time has had a most enthusiastic reception. It is intended only as a text on anatomy. It does not deal with pathology or therapy. Dr. Bassett has all he can undertake at present to complete this comprehensive work by the end of 1958. But the quantity of professional inquiries we receive concerning other subjects proves to us, at least, that the world of medical science wants such three-dimensional illustration. This is particularly so in those fields where the accurate re-creation of depth can add so immeasurably to the effective understanding of the subject material. We appreciate sincerely this opportunity to make such a statement to this Association, whose members are so closely allied to the creation and production of medical and scientific illustrations. We respectfully urge you to seriously consider and explore the available methods of employing stereo in your work, to the end that its full value to the world of science and medicine will be assured.

And now, with your permission, we would like to demonstrate by three-dimensional projection some of the things we have been discussing. By this method we offer you a "taste" of the effectiveness of stereo as a medium for illustration. While you will not be able to measure your personal rate of recognition or your degree of retentiveness of these pictures, we think the fact that stereo offers definite superiority in both areas will be readily apparent.

In this first picture we show the typical black and white line drawings which have constituted the bulk of medical illustrations until recent years. Next we show the identical subject in two-dimension color photography. (See Figure 1.) The simulation of depth and the use of natural color vastly increases the "understandability" of the subject. Now, here we show the same picture but this time in three-dimensions. (See Figure 2.) The actual depth employed cannot help but increase recognition and retention. We'll repeat this three scene cycle picturing another dissection area.*

With these brief samples, in which you employed all of your faculties of binocular vision, we believe you can clearly understand that the mental sensations created provide a medium of illustration whereby the subject material can be much more easily recognized and understood. Again, we invite you to assess this medium.

*If the reader would like to experience this demonstration, a free copy of "Stereo As A Medium For Medical Illustration", (one of the special VIEW-MASTER 3-dimension picture reels shown at the Symposium), may be obtained by writing to Sawyer's Inc., Consumer Service Dept., P.O. Box 490, Portland 7, Oregon. Be sure to request the reel by the title given above. This reel may be viewed in any of the various models of VIEW-MASTER stereoscopes.

Medical Photography in Action*

H. LOU GIBSON, FBPA

Medical Division, Eastman Kodak Company

Illustrated with Reproductions from the 1953 Annual Exhibition of the BPA.

FUNDAMENTALLY, a medical photograph is a graphic aid for conveying information. In order to reap the full benefits of its potentialities, the user must understand both the functions of visual aids and the special properties of photographs. The reason is that the success of any presentation demands more than technically good photographs. This can be readily appreciated by considering the teaching field for a moment. Here, the success of the instruction hinges on a suitable development of the topic. An inept story can be well illustrated, yet succeed only to mislead.

A facile transfer of ideas does not automatically become the reward of merely using modern graphic aids. The teacher must know exactly what subjects should be placed in front of the lens. The photographer must know how to arrange and light the correct aspect of the subject. The true effectiveness of a medical photograph as a graphic aid to spoken or written material, therefore, will depend on the acumen on the educator and the skill with which the photographer has recorded the "story."

The functions of illustrations, such as the photographs with which we are primarily concerned here, are to take the place of words and to augment and clarify the remaining discussion. Obviously, it is necessary to decide the respective roles of pictures and words. For instance, a presentation necessitating a large amount of description usually becomes "long drawn out" if words play the leading part; efficiency could be increased by employing photographs to carry the burden of description. On the other hand, an illustration that does not add much information to what a reasonable number of words could provide is also inefficient. Sometimes a photograph can be utilized to "repeat" data in a different way for emphasis. When such reiteration is ineffective or unnecessary, the illustration is only an ornament. It is essential then to learn how to arrive at a judicious balance between the graphic and the verbal in order to provide efficient discourses.

To crystallize the argument so far, a well-known medical graphic aid can be called upon as a familiar reference the simple, taken-for-granted temperature chart. Suppose a clinician had to present verbally the absolute and excursional data that the temperature chart in a case of undulant fever would show at a glance. What a cumbersome array of words would be needed! Even then, words alone would be relatively ineffective in generating an idea of the characteristic undulatory nature of the temperature curve that is a major feature of the disease. The chart quickly imparts a visual concept of these variations. Once this has been mentally assimilated, the words "characteristic undulations" have the full significance of

*Adapted from MEDICAL RADIOGRAPHY AND PHOTOGRAPHY.

a lesson well learned they have been implemented by the chart, which is then no longer needed in every discussion.

In the absence of a graphic illustration, recourse to a verbal "picture" is often necessary. For example, the temperature curve as drawn on the chart might be likened to the silhouette of the Grand Tetons, but this would not be too helpful to the listener who did not know the Teton mountain range. However, through a series of such references to previously acquired visual experiences (universally familiar serrations in this case), words alone could be used to convey a fairly accurate concept.

Good judgment demands that photographs not be utilized to illustrate unimportant, too obvious, or irrelevant points. The significance of this can be readily seen by returning to our analogy. Obviously, the utilization of the temperature chart as a graphic supplement could be superfluous on the following occasions: in a discussion limited to the splenic changes associated with undulant fever (unimportant); in discussing therapy and dosage intervals with a professional equal rather than a student (too obvious); or in a paper on the public health aspects (irrelevant).

The photograph, like any graphic aid, does not have unlimited powers of instruction. It can seldom "stand alone": a complement of words and sometimes supplementary illustrations are needed. It would be academically dangerous to present a student with a series of temperature charts for the different types of undulant fever and not thoroughly discuss and draw attention to the fine points of similarity and difference. Also, sessions devoted to tropical medicine call for additional demonstrations of the characteristic curves in kala-azar, malaria, and other undulatory diseases.

The object of any presentation is the communication of experience by those with the greater knowledge to those with the lesser knowledge. Since contact with reality is such an important phase of experience, a photograph has special properties as a graphic aid because of its realism—its potential fidelity of detail and accepted authenticity. For example, the very tangible stages of plastic surgery can be most convincingly illustrated with photographs because the viewer accepts the illustrations literally. And he does not have to pause mentally to orient himself with respect to reality. Photographs, of course, are only one type of graphic aid. Charts, drawings, schematic models, and other nonphotographic aids are often selected when general conditions or probable relations are dealt with, when a wealth of "photographic" detail might be confusing, or when the viewer might unguardedly gain from photographs an impression of relations that actually do not exist. It should not be overlooked that patients can serve as visual aids and that moulages can be quite realistic. The teacher will have to decide which aid is best or expedient. The quickness and readiness of photography is sometimes the deciding factor.

In the previous discussions the examples have been drawn largely from the teaching field because the need for graphic aids there is obvious and long accorded. However, the considerations for effectiveness and efficiency apply in other fields as well. The reason is that fundamentally all medical photographs are made for instruction. A person making (or ordering) a photograph does so either for imparting information to others or for his own information. Both the research worker and the clinician in private practice can use photography

for "taking notes." The skills and qualities discussed for the teaching aids proper are needed in such applications too; this will be apparent to anyone who has struggled to interpret his pencil notes a year after they were made.

So far the argument has been general and largely philosophic. Each individual will have his own notions about specific details. However, here are some practical steps that can be taken in working out an illustrated presentation:

1. The APPLICATIONS of medical photography should be surveyed so that photographs can be used wherever they can serve a purpose.

2. The PURPOSE of each photograph should be defined exactly, so that camera techniques can be planned that best emphasize pertinent features.

3. The BALANCE between photographs and words should be carefully considered, to preclude slowing down a presentation with wordy descriptions.

4. An APPRAISAL of the photograph, caption and context should be made as a safety measure for clarity.

The procedure for evaluating photographs from these four viewpoints is demonstrated in Figures 1 to 4. The examples are not intended to be restrictive; most of them could be employed to demonstrate each of the points covered. All were selected because they already had illustrated medical situations or conditions and done this well.

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1 APPLICATION

Wherever there is a need for description, there is a potential use for photography. This is true in all fields of applications, from the obvious one of teaching to the less well recognized one of office practice.

In office routine, the most immediately apparent application of the graphic

Figure 1A. Hernia, left Loin: John L. Templeton, Medical Illustration Laboratory, Veterans Administration Hospital, Montgomery, Alabama. Progressive posttraumatic hernia from stab wound 27 years previously. The sac contained retroperitoneal and perirenal fat protruding through a defect in renal fascia.

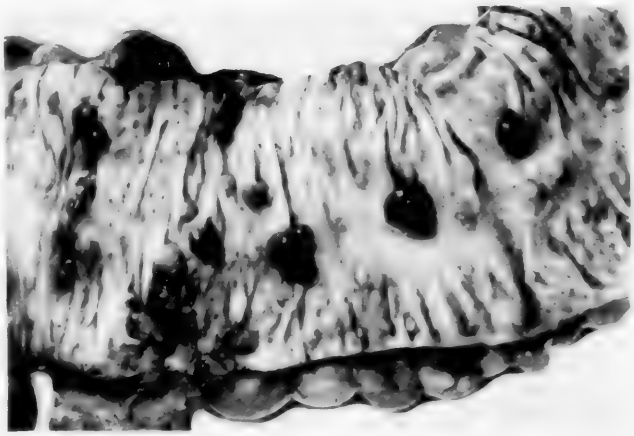


Figure 1B. Multiple Polyposis of Intestine: Earl C. Bartlett, Medical Illustration Laboratory, Veterans Administration Hospital, Dearborn, Michigan. A close-up record of part of the specimen depicts the incidence and character of this "classical" example of the disease. A more distant record made at the same time showed the extent of the involved intestine.

Figure 1C. Osteoplastic Craniotomy: Charles P. Hodge, Montreal Neurological Institute, Montreal, Canada. In this institution, brain operations such as this one for the relief of seizures are photographed with a special camera in an anteroom off the theater. A lens of long focal length picks up an image from a mirror on the ceiling behind the patient. In this way the photographer need not enter the operating room.

aid is as a method of helping to keep adequately detailed records. Yet there is an even more valuable application. The physician can utilize serial photographs in conditions where the clinical appearance is complex and where slow improvement may be otherwise difficult to follow or to demonstrate to the patients. Some cases, too, may be so mild that a prediction that "it will clear up soon" or "the child will grow out of it" is made, but a photograph in the case history is a safeguarding "reference point" for future comparison. Sometimes unforeseen physical changes occur (Figure 1A) and adequate photographic records offer a means for removing doubts as to their origin.

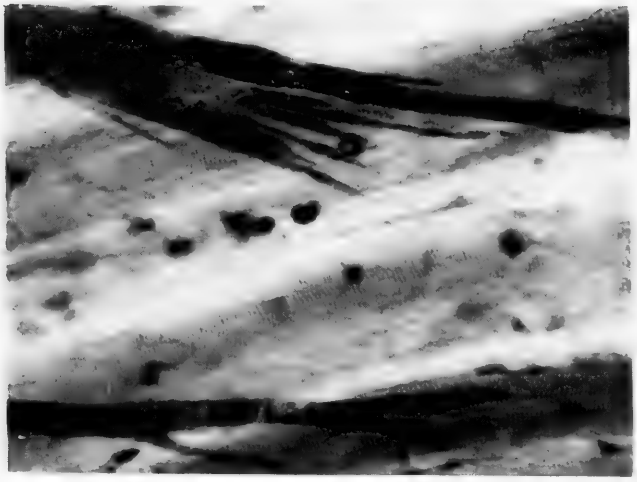


Figure 1D. Branched Insertion of Skeletal Muscle: F. W. Maynard (courtesy, Chas. Pfizer and Company, Incorporated), Biology Department, Boston University, Boston, Massachusetts. Striated muscle is usually depicted as tapering into a tendon that in turn fastens to a part of the bony skeleton. In this picture, however, the muscle is shown spreading out into individual fibers to become inserted directly into the connective tissue of a thin transparent membrane.

Figure 1E. Manual Arts Therapy: Robert D. Little, Medical Illustration Laboratory, Veterans Administration Hospital, Roanoke, Virginia. Of the many manual activities for psychotic patients, pottery making has a certain expressive quality and provides intriguing illustrative material for directing attention to therapy.

In the academic field, illustrations are universally recognized as necessities. This is true whether the "teaching" takes the form of classroom instruction (Figure 1B), professional lecturing (Figure 1C), exhibiting, or publishing (Figure 1D). Photography is indispensable for many classroom sessions or professional clinics, because it is obviously impracticable to rely on the availability of actual patients as "visual aids" quickly and when needed.

Furthermore, photographs are valuable even in those fortuitous cases where patients *are* available, because the brief examination permitted a student will accomplish more if he has previously been familiarized with the disease through photographs. He will observe significant details more closely and learn more thoroughly.

In research, photography serves to take "instantaneous" notes of observable conditions for lengthy study and for documentation. Sometimes it can also record the invisible, such as the loci of atomic radiations, as well as events too fast, too slow, or too complex for the eye to follow. Photography can also preserve the fruits of many hours of careful preparation long after the experiment has been terminated or the specimen has ceased to exist.

In addition to the intellectual aspect of photographs, the emotional impact often has to be considered. This is particularly true in providing human interest for institutional reports and press releases in the field of public relations. For example, there is artistic warmth in Figue 1E. Recounting the benefits of manual therapy is not nearly as convincing as showing the hands busy in creative endeavor. That the patient is relaxed and absorbed is easy to believe, and hence satisfactorily portrayed by such photographs as this.

2 | PURPOSE

The purpose of the photograph must be clearly in the mind of the one employing it. Also, since it is almost invariably used in conjunction with a verbal passage, the part that words can best be used to describe and the details that the photograph can best demonstrate need to be thought out together. This planning should be done in outlining the lecture or paper, or even case history, and the photographs made only after their purpose is clear. A few illustrations "from the files" should not be just "thrown in" merely to break up and decorate the verbal material. Of course, a backlog of lucid photographs is most helpful, but new ones should be made when the old ones are not appropriate.

A very practical reason for this preplanning is that the purpose of a photograph will govern the photographic technic employed and the equipment needed to make it.

What is the graphic function in Figure 2A? It is to delineate the external aspects of the ocular tumor; it is not to show that the subject is human, male, and aged. Therefore, a medium close-up is selected. On the other hand, an extreme close-up is called for in order to clearly depict the membrane in Figure 2B. A medium close-up would show more of the details in the iris and conjunctiva, but these are not significant here. If they were, additional photographs could be included. Also, the anatomic region is efficiently established by the single word "pupillary." Hence, more of the orbit need not be included; to do so would detract from the value of the photograph, because the image of the membrane would be smaller and attention diverted from it. When it is concluded that a few words can "illustrate" the photograph, the latter can be planned to effect the major part of the communication.

Figure 2B. Congenital Pupillary Membrane: Margaret Markham, 207 East Fifteenth Street, New York, New York. This extreme close-up necessitated the use of specialized photographic equipment.

Figure 2A. Lipoma: Percy W. Brooks, Department of Photography, Cornell University Medical College, New York, New York. Electronic flash illumination simplified the close-up photography here; it eliminated the possibility of subject-motion, which can impair texture rendition in close views.

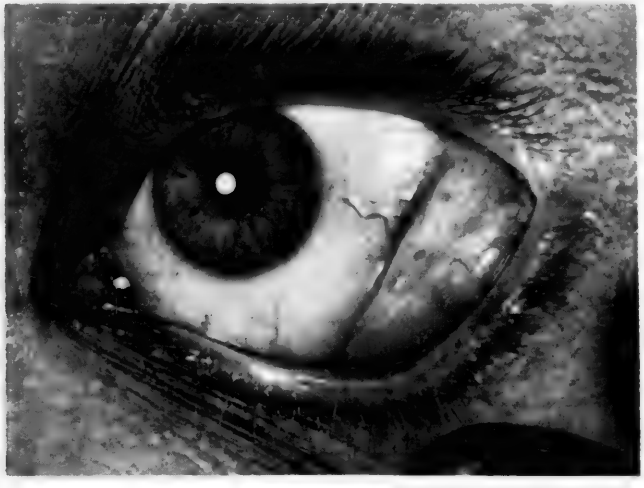


Figure 2C. Vena Cava Block: Allen Weinberg, Medical Illustration Laboratory, Veterans Administration Hospital, Coral Gables, Florida. Careful attention to an evenly balanced, 50-degree lighting contributed to the clear delineation of veins in this infrared record.

The condition in Figure 2C is marked by venous prominence and tortuosity; infrared photography is the technic of choice. Autoradiography is necessary for the intricate information offered by Figure 2D. The medical procedure to be described with Figure 2E as an aid is exacting; so, this particularly instructive photograph is of great assistance. Imagination and ingenuity are highly desirable assets to technic.

Figure 2E. Translaryngeal Anethesia: Harold C. Baitz, Medical Illustration Laboratory, Veterans Administration Hospital, Buffalo, New York. Composite photographs like this can be made by alternately masking and printing the two areas during enlarging or by copying a paste-up of the components.

Figure 2D. AK Mouse Skin with C^{14}-labelled Adenine: Jerry Weinstein, Department of Biophysics, Sloan-Kettering Institute for Cancer Research, New York, New York. This embryonic skin was grown in a C^{14}-labelled tissue culture medium. The autoradiograph revealed that the adenine has been taken up primarily by the basal cell layer.

3 BALANCE

Since a photograph is made for the purpose of conveying information, its efficiency depends on the amount of pertinent data it reveals, and this is often an unappreciated volume of detail. For example, how would the visual appearance of the condition in Figure 3A have to be described were a photograph not available as an aid? Tell a beginning student that the condition is a swelling in the lower part of the arm, and he may think only of a lump above the wrist. Distinguishing between arm and forearm would correct some of this, but even for a student who knows anatomy, a description of what the photograph so effectively shows at a glance would be long and would have to go something like this:

The area in question is an evenly rounded, ovoid swelling on the anterior aspect of the distal portion of the right arm of an adult male. The mass is about 10 centimeters wide. Its greater axis is 14 centimeters in length and runs obliquely along the arm. The distal end of the tumor is directed medially; the angle between its long axis and the longitudinal axis of the arm is about 45 degrees. The condition appears to displace and perhaps involve the biceps. The firm swelling is well circumscribed. There is no surrounding erythema. The superficial tissues are not abnormally vascular; the skin is smooth and lightly stretched. There is no abnormal pigmentation, scaliness, ulceration, nor discoloration. (The findings of palpation, of course, would augment the facts that cannot be seen or photographed to provide a full description.)

Such is the verbal aggregate put into the graphic nutshell of Figure 3A. How much more cumbersome would be the complete verbal presentations of the panoramic information offered by Figures 3B and 3C!

Figure 3A. Tumor, Distal Third, Right Arm: R. M. Christopher, Medical Illustration Laboratory, Veterans Administration Center, Temple, Texas. A strong, main lighting at some distance from the camera axis was used to depict the roundness of this subject.

Figure 3B. Paresthesia Pattern: Verlin Y. Yamamoto, Medical Illustration Laboratory, Veterans Administration Center, Des Moines, Iowa. The region of paresthesia following the removal of a cyst from the cauda equina was delineated with gentian violet. The bizarre pose and the inset permitted complete presentation of the areas in a single, though compound, illustration.

Another point demonstrated by Figure 3A is the fact that the description per se could be elucidated by the graphic aid on occasions when the condition is the subject of study from a terminological aspect. Thus, one should not lose sight of the fact that photographs can be used to clarify as well as to save words. As a final point of efficiency, Figure 3A would not be needed in a purely histologic discussion — the words "tumor of the arm" would probably be sufficient description.

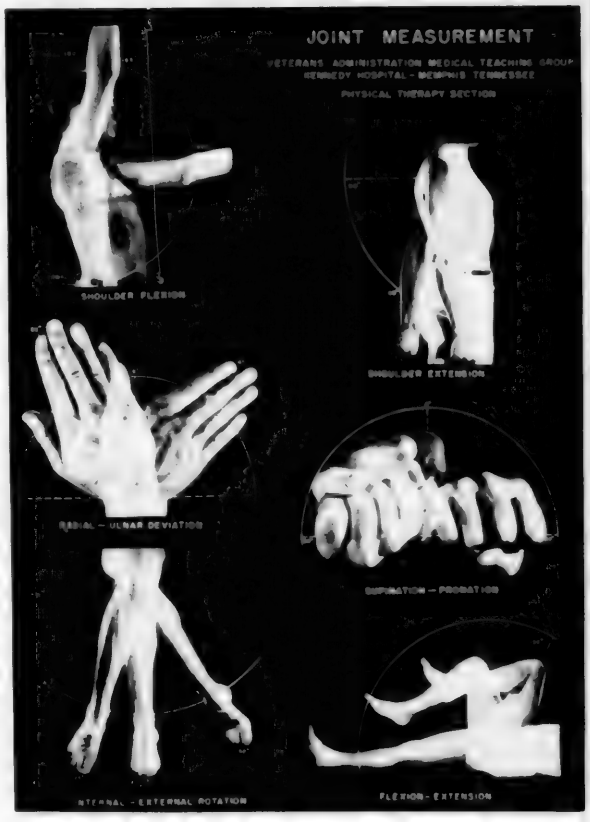
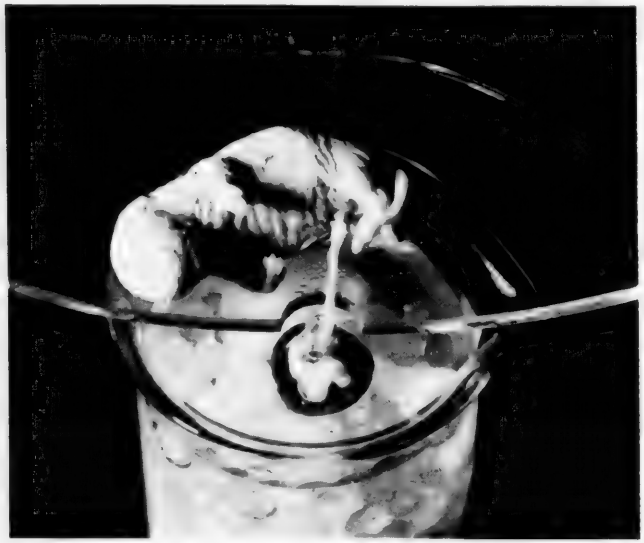


Figure 3C. Joint Measurement (shown here in part): Alex A. Gravesen, Medical Illustration Laboratory, Veterans Administration, Medical Teaching Group Hospital, Memphis, Tennessee. These multiple-exposure photographs were made to work out positions and base lines for a proposed American standard.

4 APPRAISAL

How well does the photograph do its part? This is a safeguarding question that should be honestly answered, both when a photograph from the files is being selected and when one is specially made. For example, the photograph shown in Figure 4A was adequate for its original purpose — to show the set-up. But suppose a photograph of a mouse fetus were subsequently needed in some other connection. The temptation might be to use this negative from the files and make a modified print as shown below. Obviously, this portrayal would not be adequate for the new purpose because the mouse is neither suitably posed nor lighted to depict fetal anatomy as clearly as could be done by making a new negative.



Sometimes the camera image is not the same as the mental image. For example, those associated with the patient shown in Figure 4B know he has a furrowed tongue. A haphazard request to make a "close-up of the mouth" might result in an illustration something like this. It would recall the patient to those familiar with the case and could easily delude them into presenting it. But it would be a

Figure 4A. Fetus and Placenta of Mouse: Norman D. Gaines, 333 East Twenty-Fourth Street, New York, New York. Side lighting was needed to bring out the glass beads in the nutrient solution. By carefully adjusting the height of the lamp, the fetus could also be delineated with the same lighting. (The section of this illustration shown at the right is discussed in the text above.)

worthless picture of the tongue for those who were not aware of the information the photograph was supposed to impart. As it happens, the figure is actually a record of the upper gum, and it is a successful one for *this*.

Quite often, one picture is not enough for the story. Figure 4C, left, records thin fibers surrounding a living granulocyte in human blood and also its pseudopod. However, the photographer wisely included the other record (Figure 4C, right) for the complete story.

Figure 4B. Carcinoma of Gum: Nat C. Kantor, Medical Illustration Division, Veterans Administration Hospital, Bronx, New York. A simple front lighting showed the shape of the involved gum against its own shadow.

Figure 4C. Movement of Blood Cells: Lester V. Bergman, Bergman Associates, Brooklyn, New York. Living cells can be studied and photographed by means of the phase microscope. Utilizing a small drop of blood, a very thin smear was produced and this resulted in a minimal halo around the cells and good edge definition.

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Statistics, Slides, and Sequences

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Increased applications — effect of visual forms — balance audio and visual stimulations — line or bar graphs — pictographs — humanization — T. V. requirements.

THE presentation of statistical data in graphic form dates back thousands of years—the use of statistical slides to the earliest development of the lantern slide. With the increasing use of slide sequences, motion pictures, and television as teaching aids, the use and preparation of statistical slides and sequences in audio-visual presentations deserves review. In the initial stages of this presentation I shall briefly discuss the nature of statistics and the evolution of the statistical slide.

Basically, statistics are "classified facts" reproduced in symbolic forms such as numerals, graphs, and diagrams. The lantern slide became widely used as a medium to convey statistical data in the middle nineteenth century. It predates the production of the photographic plate, since projection devices were utilized with glass plates containing drawn and painted images. However, with the development of emulsion coated glass plates in the middle nineteenth century, lantern slides became an important part of audio-visual presentation methods.

Artists and lecturers were quick to utilize and exploit the pictorial lantern slide. Hand colored lantern slides became the "stock-in-trade" of the Chautauqua performers presenting the wonders of the world. With the development of color emulsions the popular name of "The Magic Lantern" was truly deserved. Technical triumph followed technical triumph until we have the modern, flexible base, multi-layered, high speed color films of today. With these fine materials, the talented photographer—amateur and professional—records the wonders of this day.

The need for reducing data to visual form is a vital part of any scientific photographic program. From the individual photographer to a large department of 16 photographers, artists, clerks and television personnel like ours, must come every effort to make the statistical presentation meaningful. An obscure or misleading interpretation is less efficient in communicating information than the raw data. On the other hand, a well thought out chart or pictograph engenders a rapid comprehension that cannot be surpassed by any other medium. It is the purpose of this discussion to suggest what can be done in this field so that interest in using this phase of scientific photography might be stimulated.

While the progress of the pictorial slide has been spectacular, a critical look at our use of the statistical slide reveals a quite different and disappointing picture. The earliest use of the slide to

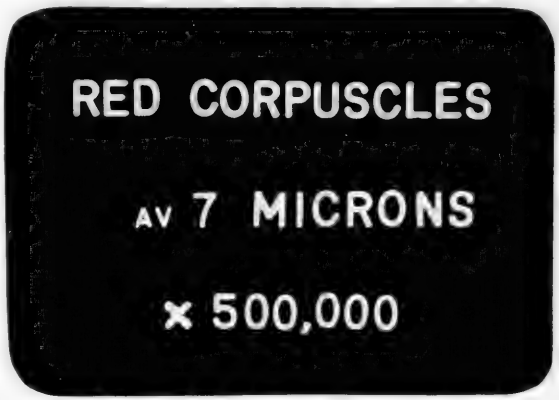
convey statistical information consisted merely of transferring the printed page or hand-drawn illustration to the screen. The technique used was the same as for the pictorial slide—first a negative was made and then a positive slide was produced, thus faithfully reproducing the original. Time has shown that much material prepared for inclusion with a paper or report is not necessarily suitable for use as a lantern slide, since it may contain much irrelevant material, such as illustration numbers, captions, footnotes, etc. To make matters worse, the lecturer often stood before the audience and proceeded to read the material from the screen. So a lantern slide, instead of serving as a visual aid, became a visual "crutch." Even today many statistical slides show more kinship with the printed page than with a projected, visual aid for use in an audio-visual presentation.

In the finest use of audio-visual methods the audience is carefully led through an experience in which the senses of sight and hearing are stimulated for the greatest possible impact. Sound, color, humor, drama are skillfully organized to hold the attention and impress the memory. Properly prepared, statistical slides have a vital role in conveying classified facts. Improperly prepared, with illegible lettering, eye-fatiguing high contrast, and superfluous wordage, they become deadly enemies of the spe.

It is far better to place the audio presentation and visual presentation in juxtaposition than to insult the intelligence of the audience by reciting word for word the text of slides flashed upon the screen. In this technique, a pictorial visual, in many instances only remotely associated with the subject under discussion, is used to catch the attention and arouse the curiosity of the audience. While the viewer is momentarily off guard, the voice, or audio medium, is used to impress certain facts.

Lack of imagination is evident in many statistical presentations. Intended data is often so distilled that the symbolic presentation is completely disassociated from the original object. Lantern slides can be made that are helpful in properly orienting the audience. Data can be superimposed over background scenes or objects, and sketches can be utilized to clarify vague points. Series of slides can be developed to quickly give audiences some background and perspective in areas in which their knowledge is limited. For example, suppose we wish to explain to a lay audience some of the uses and advantages of the electron microscope over the human eye in examining a red corpuscle. We could use words and numbers on a slide to achieve this by stating that the average diameter of a red corpuscle is seven microns and by utilizing the electron microscope it can be enlarged 500,000 times. (See Figure 1.) We have presented some statistical data, but upon

Figure 1. A slide with a "raw" statistic that carries little meaning for many audiences.



analyzing our material I think that we can agree that our audience still has very little concept of the marvel accomplished by the electron microscope or the way it is operated.

How many persons in the average audience can even correctly visualize an electron microscope? The word *electron* to most people is vague, while *microscope* recalls memories of an optical instrument of metal and glass some ten or twelve inches in height bearing little resemblance to the modern electron microscope. How many persons are capable of visualizing a circle with a diameter of seven microns, and if they cannot visualize this circle how can they magnify it 500,000 times? If we cannot assist our audience in relating this material to something with which they are familiar, it becomes apparent that we cannot reveal to them the vast research potential of the electron microscope. This is a situation which readily yields to a slide sequence development, see the slide sequence illustration series in Figure 2. We can show slides of the electron microscope highlighting its electronic components. We can show the microscopist utilizing the instrument. We can utilize a "pictographic" slide to show that we can examine a red corpuscle which is so small that it is invisible to the human eye and magnify it 500,000 times until it would occupy fourteen stories of the Empire State Building. And we can stimulate their imagination and participation if we suggest all the information that the scientist can discover

Figure 2. Part of series of slides showing details of the electron microscope and preparation of material. The pictographic slide makes the same information in Figure 1 tangible by dramatizing the enlargement in the image of a red corpuscle.

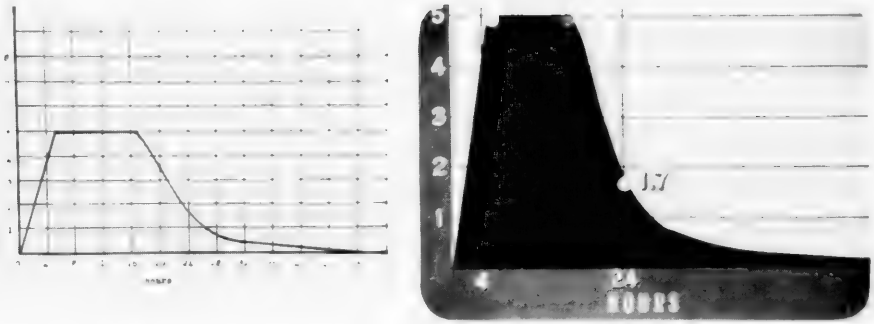


Figure 3. Two slides presenting the same data. The slide on the right has been simplified and presentation made more dramatic by enlargement of the vertical scale, by highlighting the points the speaker will emphasize, and by solidifying the line graph by color overlays that produce a plane graph.

as he roams through this structure opening vistas that have never before been scanned.

Statistical material should be carefully reviewed to prepare it for lantern slide presentation. Very often it may be found desirable to change a line graph to a bar graph presentation, since the larger visual areas involved can be more quickly interpreted in most cases. When the line graph is the method of choice, care should be exercised to maintain sufficient weight of line. Occasionally, changes in scale can greatly improve the graph presentation, and volume can be achieved in line presentation by use of contrasting values or color above and also below the upper limits of the graph line. The effect is shown in monochrome in Figure 3 to indicate the greater readiness with which the data can be grasped.

Pictographic methods can be effectively used in preparing statistical material. Familiar objects can be simply reproduced to indicate quantity, time and temperature. This device is shown in Figure 4, which was used to demonstrate the employment of a photographic developer diluted with four parts of water, used at a temperature of 68° for a period of three minutes.

Color coding can also be used, not only to clarify graphs, but also to lend psychological impact. Much research is now being conducted to determine why certain colors evoke certain responses, but without getting involved in technical discussion it can be stated that colors do have definite effect in most people. Red is traditionally a symbol of danger; orange of caution and warmth; blue of

Figure 4. This simple pictographic slide utilizes symbols known to every photographer to dramatize a developing time formula.

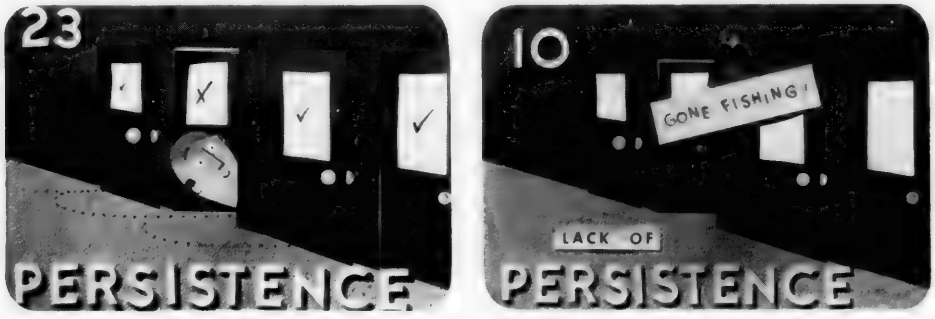
truth, loyalty, and coldness; green of restfulness. In the preparation of medical statistical slides, this information can be used to good advantage to highlight the malignancy of disease or the effectiveness of a drug. This technique has wide application and can be employed, with many variations of hue, chroma, and value, to give subtle support or create violent impact in a slide presentation judiciously of course.

Statistics can also be "humanized." As an example, a few illustrations are shown from some statistical data collected in a recent survey conducted by the Section of Medical Psychology, The University of Texas M. D. Anderson Hospital and Tumor Institute, to determine *Environmental Factors and Individual Motivation Conducive to Research*. Since the statistical information represented human response to certain conditions, it was decided to create a character symbolizing the research scientist. Having done this, he was placed in various situations in which the picture conveyed the scientist's evaluation of his situation with such imagination and humor that the audience's attention was easily held while the speaker presented additional related data. (See Figure 5.)

Some reference should be made to trends in slide presentation for television use. The TV medium restricts the slide to a horizontal format. Before preparing slides for television the art work standards of the local TV station should be investigated. As a rule, horizontal 35mm color slides are acceptable. Legibility of lettering or drawing should be achieved by use of contrasting values rather than contrasting colors, since most receivers are black-and-white and will not differentiate well between contrasting colors of similar value. The lack of resolution in the television image also influences the size of lettering that may be safely used in preparing material. While letters 1/25 the height of the art work may be used for slides to be conventionally projected, the television slide should have letters no smaller than 1/10 the height of the art work.

Today's photographer, equipped with fine cameras and color film, and employing critical evaluation, ruthless elimination of unnecessary detail, color, humor, and dramatic design, can do much to improve the presentation of statistics in slide sequences. Skill will increase efficiency in all biological teaching.

Figure 5. Two examples of "humanized" statistical slides. These slides interpret the data pictorially with color and humor. This technique allows a speaker great flexibility in developing material for varied audiences.



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Notes on the Use of Cameras by Field Units in Cancer Investigations

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Chairman, New Jersey Medical Committee,
American Cancer Society

Need of photography in scattered clinics — simple equipment — routine photographs.

WE have forty-six individual tumor clinics located in various parts of New Jersey. They are each fully equipped to handle all the necessary procedures for the early and proper diagnosis of cancer. Usually they are associated with hospitals having complete facilities for radiation therapy and surgery. Our photographic requirements are served either by the photographic department in the hospital or by setups in the clinics.

We find the need for photography in all the applications common to hospitals and medical schools. Illustrations for teaching, publication, and clinic or hospital staff meetings are routine. In addition we have a large need for the intercommunciation of information in statewide cancer meetings as well as in the steady exchange of data among clinics. One of the big technical advantages of a clinical grouping involving as many patients as ours is this feature of "comparing notes." It is immensely facilitated by means of photography, because the groups are scattered.

Then again, photographic notes are invaluable on an individual scale for the specialist. So many cancerous proliferations, or regressions, are slow. The changes can nevertheless be visualized and followed by means of serial color photography. Such records are widely used in illustrating the case histories, findings, treatment reactions and follow-up reports of a large number of patients. The photographs save countless pages of written notes and communications.

There is one particular need in our activities that is worthy of special note. We are often faced with the statistic evaluation of certain forms of therapy. Photography enables us to make consistent judgments and comparisons throughout the units.

There is no attempt made to insist that each of our clinics install a photographic facility. Nevertheless we have suggested and authorized an inexpensive outfit utilizing flashbulbs and a focal frame for simple quick color slides as a minimum setup. This will provide the majority of records needed and yield acceptable results of all but the most exacting subjects, see Plate II, page 20. Many of those stations not serviced by a photographic department have so equipped themselves and found the system easy to apply and the slides entirely satisfactory. Even in a busy clinic, photographs become practical because of

the small effort and slight experience involved in photography. Such equipment enlarges the group that is efficiently and economically utilizing photography.

It is beyond the scope of these notes to discuss the well-known equipment and methods utilized in the full-fledged photographic departments.

Our experience has shown that photography is an indispensable means for helping to integrate the efforts of teams working in separated localities. We have adopted medical photography in our cancer work today so that it is an integral part of our routine workup of all new cases. Just as blood counts and other laboratory tests are done routinely so is the making of photographs of lesions before therapy a routine. Nurses, technicians and occasional help all can use our equipment efficiently. Later references to these cases therefore give exact representation of disease in a way that words cannot do.

Fundus Oculi and Eye Certificate of Merit Edward K. Sims, BPA

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Promoting Health by Visual Methods

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Widespread departmental activities — health promotion — channels of communication — literacy limitations — exhibits simple and dramatic — health museum — teaching communication to faculty — post-graduate course in medical photography — specimens in plastic — television experiments.

AT this point in the middle of the twentieth century it is possible to arrive at a broad philosophy of the relationship of health and disease and their effect on mankind.

It is not the purpose of this paper to present new information concerning our progress in medical science, but rather that of suggesting more effective ways of communicating existing knowledge in the health sciences.

The first objective is to outline some of the principles and techniques involved in communication and secondly to relate something of the activities of visual communication at the medical center at UCLA. In regard to the latter, it must be admitted that much of this falls under the heading of future plans since the medical center is so recently established.

The permanent teaching facilities at the medical center were occupied in the fall of 1954 and include schools of medicine, nursing and public health. The clinical teaching hospital attached was occupied during the summer of 1955. Facilities for medical photography were included in the plans, but the activities have already far outgrown the space provided. The visual aids department includes photographic and medical illustration units as well as a pool of visual aids equipment for use in lecture rooms. It also serves as the central purchasing department for all photographic supplies and retains inventory control over photographic equipment used for teaching and research by the individual medical center departments. The director of the department holds academic appointments in both the Schools of Medicine and Public Health, which facilitates combined use of teaching and service facilities for either purpose. He is responsible directly to the Dean of the Medical School.

Total Health

Total health is a concept which embraces the whole physical, mental and social man in his environment. It includes the various states of disease which occupy most of the energies of the medical and surgical specialists in diagnosis and treatment. It also includes the preventive aspects of medicine such as specific forms of immunization, or sound nutritional practices to prevent mineral and vitamin deficiencies.

Total health is conveniently based on a four part program of activity:

Promotion of health–prevention and control of disease–early diagnosis and treatment–rehabilitation.

What cannot be prevented and controlled should be diagnosed and treated early so that residual disability is minimized and the need for rehabilitation diminished. Each successive stage of endeavor implies some degree of failure at a previous level. Ideally then, optimum health depends on stage 1 by promoting maximum development of the inherited characteristics by exposure to the best possible environment. Stages 2, 3 and 4, are largely matters of professional concern in working with individual patients. Stage 1 demands the application of medical science to the lay individual, singly or in groups. It is achieved by health education.

Health Education

Health Education is using the educational process for promoting health. It is more than the transfer of facts since its ultimate objective is to result in some form of positive health action. It involves four major stages each of which have positive and negative aspects. These are: (1) knowledge (2) communication (3) motivation (4) action; (Figure 1). The ultimate degree of effective action on the part of an individual to promote health will depend on the degree of efficiency of each of these stages: If the facts are wrong and the communication highly effective such as frequently occurs in commercial health propaganda, then "negative" health education may result.

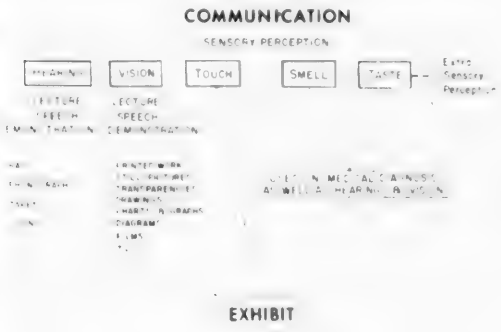
In many instances the key to action lies in stage two, communication. Skillful selection and use of the method of communicating the facts and exposing the fallacies may provide the key to positive motivation and action. This is more likely to occur if the individual can be involved directly in participation.

Communication

Communication is achieved through sensory perception by stimulating one or more of the five senses; sight, hearing, taste, smell and touch; (Figure 2). Motivation and action may result in man when he thinks and reasons about the stimuli which reach him. Sight and hearing are the most powerful channels of stimulation to impart complex facts. Language in either written or spoken form can be the most explicit method of communicating an exact idea. Difficulties however, are introduced by virtue of semantic problems and limitations of vocabulary. Audio-visual methods of presenting the facts of health and disease can play an important part in both professional, medical and paramedical education, as well as health education for the lay public. In health education the combined use of all the senses may be used to convey the health message intended to arouse motivation and subsequent actions.

The medical photographer can achieve much by visual appeal alone, but he can usually achieve more when combining his skills with appeals to the

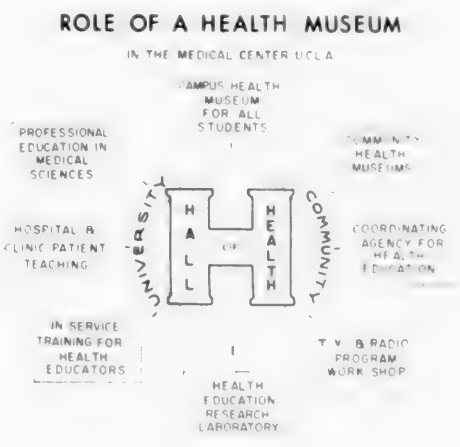
other senses. Fluoridation of water may be promoted by posters including words and pictures, but asking people to touch, taste and smell samples of both fluoridated and non-fluoridated water, is more likely to convince them that it is harmless. Their active participation is often a key factor. Medical photography and graphic arts can attract interest in this.



Exhibits

Exhibits appealing to several or all of the senses may play an important role in health promotion. The emphasis should be on the appeal. Frequently exhibits can be seen at conventions overloaded with data. Exhibits prepared for professional medical conventions may be studied more closely by the audience since it is a more select and motivated group attending such meetings. This stronger audience interest is often quoted as the excuse for filling all the available space of an exhibit area with charts and diagrams without any thought of careful planning for making an affinitive as well as definitive lay out. In fact, both lay and professional exhibits will create more attraction when they are planned as a total effect on the observers. This requires understanding on the part of the physician or other professional person originating the exhibit, of the principles and techniques used in communicating ideas clearly.

Many exhibits designed to promote the health of the lay public have only a momentary and transitory impact since they appear at many locations, such as county fairs, conventions, etc., and are often competing with a wide variety of interests. To be most effective, a permanent and separate location should be established to house health exhibits and demonstrations. Such a health museum is more than a resting place for old exhibits. It is a dynamic center of activity which embraces not only all the skills of the medical photographer and illustrator, but is also a center of teaching, demonstration and research. If it is permanent and separate from other commercial distractions it can appeal for its own sake, and will always be available for public use. It must develop a reputation for authority in the public mind, and must therefore be approved and endorsed by the various medical professions. One of the best ways to establish this reputation is the location of such a health museum in association with a university medical center. A plan for such a health museum at UCLA is outlined in Figure 3.


ROLE OF A HEALTH MUSEUM
IN THE MEDICAL CENTER UCLA
CAMPUS HEALTH MUSEUM FOR ALL STUDENTS
PROFESSIONAL EDUCATION IN MEDICAL SCIENCES
COMMUNITY HEALTH MUSEUMS
HOSPITAL & CLINIC PATIENT TEACHING
COORDINATING AGENCY FOR HEALTH EDUCATION
UNIVERSITY
HALL OF HEALTH
COMMUNITY
IN SERVICE TRAINING FOR HEALTH EDUCATORS
T. V. & RADIO PROGRAM WORK SHOP
HEALTH EDUCATION RESEARCH LABORATORY

Until such time as money and space are available for this project, attempts are being made to develop the resources for exhibit production and display whenever and wherever possible. Exhibits are constantly being prepared for professional meetings and community health agencies. Some of these can be displayed in the corridors and lobbies of the medical center.

Course in Medical Photography

As more of the faculty become interested in visualizing their teaching and research, it becomes clear that many difficulties could be lessened if some of the principles of communication as applied to medicine could be demonstrated to them. A course on medical photography has been offered several times through the University Extension, Division of Post-graduate Medicine. It is proposed to expand it in the future by developing courses which deal with the problems of preparing materials for publication and exhibition and which will enable the physician to become a community leader in promoting health. The authoritarian role of the physician in directing matters of diagnosis and treatment of an individual patient is a little different from his part in working with lay groups to stimulate their interests in health. An understanding of the principles of group dynamics and inter-personal relationships may assist him to fulfill this community leadership more effectively.

The medical center faculty, interns and residents are encouraged to drop into the visual aids department for advice on their illustration and publication problems. It is far better to learn good habits in the first instance, than to try to change defective practices.

In addition to the special course on medical photography mentioned, a curriculum leading to a Bachelor of Science degree in Biological Illustration is at present being processed through the university committees. Later when space and facilities permit, a curriculum leading to a Master of Science degree in Medical Illustration will be considered. It is intended that such programs will be limited to a few students each year for selecting the best candidates.

Special Activities

Special activities in the medical center designed to improve medical education by better visualization include the use of moulages and the preservation of specimens embedded in plastic; (Figure 4). These programs carried on by the departments of pathology and anatomy have incorporated various aspects of the photographers art. Life-like wax reproductions of pathological lesions from life or from clinical photographs are valuable teaching aids. Frequently they may be included in an exhibit which incorporates X-ray and photographic reproductions of other clinical features. Such a teaching demonstration can be more effective by combining several approaches in one display, suitably annotated with case history data.

The technique of embedding tissue specimens in plastic was pioneered at UCLA in conjunction with the Long Beach Veteran's Hospital. This technique not only preserves specimens in a more usable fashion, but makes it possible to prepare them with names and illustrations permanently included. Some such specimens have incorporated miniature radiographs or photomicrographs to make the explanation of the subject more complete. Between six and seven hundred such specimens have been prepared to date and plans are under con-

sideration for developing a library program for their use. This would enable specimens together with folders containing the complete case history, laboratory records, radiographs and other information to be available on loan for individual studies. Such a materials library could well be an adjunct to the health museum mentioned earlier.

The Role of Television

The role of television in relation to all education is being given much attention throughout the country. Experiments are proceeding at UCLA with closed circuit TV in cooperation with the Theatre Arts Department on the campus. In addition to the usual possibilities of televising surgical procedures, experiments and research with different methods of using concealed TV cameras for student observation of psychiatric and pediatric interviews without distracting the patient in front of a class of students, are being developed. The use of closed circuit TV for clinical conferences dealing with infectious diseases or very ill patients at which the presence of numbers of students would be undesirable, is also being developed.

The existence of the Theatre Arts Department on the campus with its faculty of specialists closely linked to the television production units of the commercial channels in Hollywood, creates possibilities for many future experiments in both medical and lay health education and research. The emphasis is on finding the particular functions of TV, rather than trying to compete or supplant the part for which photographs are specially suited. The two arts can supplement each other most effectively.

Cine-photography for both teaching and research purposes is already a regular activity in the visual aids department in the UCLA medical center. As soon as university policy is clarified, it may be possible to develope this activity for television as a further contribution in promoting health.

Summary

The suggestion has been made that health can be improved by methods of promotion. These methods rely on the powers of communication through the special senses. Appealing to several senses may enhance the impact of the health message. If skill is used in selecting the method of stimulation of the senses, the individual may be highly motivated to a positive health action. Exhibits can assist this process if well prepared by technical experts. They should be permanently available to the public to visit when they are so inclined. A health museum provides housing for such activities and should be affiliated with a recognized medical facility. A department of medical photography and illustration would form an essential production core of such a museum.

The medical photography and illustration units at UCLA Medical Center are developing along these lines and are producing both professional and lay health exhibits. Courses are being considered for preparing biological and medical illustrators as well as methods to assist the physician with his communication problems.

Special activities in plastic embedding and moulages are developing specimens which may later be available on a lending library basis. Finally, the proximity of the Medical Center at UCLA to established channels of commercial film and television production, suggests possibilities of future developments.

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Newer Audio-Visual Methods in Use At the University of Utah*

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Teaching responsibility — postgraduate seminars — television clinics — audio-visual kits — semiautomatic slide-sound stories — employee placement — teaching — patient education.

UTAH's College of Medicine finds itself in a rather unique position in its teaching responsibility in the surrounding area. Five of its six adjacent states have no medical schools. The nearest one—five hundred miles away is in Colorado. The physician population in these states is about one in every one hundred square miles, with an average population of about 1,000 persons per physician. Because of its obligation to its own state, the college accepts only 10% of its students from out of state. However, it is in a very good position to act as a teaching center in the field of postgraduate medicine for a large portion of the intermountain area.

The formation of a Division of Graduate and Postgraduate Medicine was a very important step in the building of a successful medical teaching center. Because of the very nature of the job, it is natural that this division employ the usual audio-visual tools in its methods and to be a leader in the application of new ones. Already organized and functioning was the production complement the Division of Medical Illustration. It was equipped and staffed to produce most of the photography, motion pictures, medical or commercial illustrations necessary. These divisions work closely in producing and distributing the audio-visual material and in the supervision of the required equipment and services.

The general teaching program has consisted of the usual three-day to one-week postgraduate courses; weekly night courses; the sponsoring of guest lectures; and visiting professorships.

These methods of instruction require the presence of the studying physician at the University lecture room—thus leaving his practice unattended during his absence. Because of the size of the area and the great distances involved, it was felt that methods which took the instruction to his hometown and even to his home would fill a great need.

Rural Seminars

A series of rural seminars were planned. With the help of grants in aid, a station wagon and a complete outfit of audio-visual equipment was obtained. Included in the outfit are standard and 2x2 projectors, a sound motion picture projector, screens, etc. Whenever applicable and advisable, such aids as anatomical models, charts, instru

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ments and other demonstration materials are added for use in a particular seminar. In this manner seminars can be held in outlying communities to the advantage of doctors, giving them the benefit of the knowledge and experience of a specialist in a particular field. This program is successful and is continuing in present use. (Figure 1.) A list of 26 faculty members has been provided to medical societies for their use in obtaining a seminar on any one of 90 topics.

In an effort to further the physician's postgraduate study even in his home newer techniques were developed. At the Annual Meeting of the Biological Photographic Association at Atlantic City in August of 1954, Dr. Robert S. Warner of Utah reported two additional methods of communication in the field of postgraduate medicine which had been given a trial.[1] These were the use of open-circuit television in the presentation of Postgraduate TV clinics and the preparation and circulation of Audio-Visual Seminar Kits. I have been asked to tell of the present status in our use of these methods of teaching.

TV Clinics

The television clinics consisted of two series of four telecasts each.[2,3] They were televised as a public service without charge by Station KDYL-TV (now KTVT) and were awarded Variety Magazine's annual award for the most significant TV aid to education

The broadcast hour was at 7 until 8 o'clock on Tuesday mornings. This left an hour break after the telecasts before the regular broadcast day began. All physicians in the reception area were notified by mail. There was no public announcement.

Because the effort was an experimental one, a thorough evaluation was obtained to learn the size of the audience and its appraisal of the program. The first series was evaluated by a business research organization.[4] This survey, in the main, indicated a high degree of success and brought out many constructive criticisms. Of 700 potential viewers 81% were contacted; 49% had seen at least one program and 60% of these practiced outside of Salt Lake County. An 80% thought the programs were good, 17% average and 3%, not so good. In the presentation of new facts the individual programs were reported to be effective in the increasing order from 69% to 94% between the first and last of the series, indicating that production efficiency was increased.

The type of presentation preferred

Figure 1. Drs. E. G. Holmstrom and L. Paul Rassmussen loading station wagon with slides, motion pictures, projectors, etc., for a rural seminar trip.

Figure 2. Open-circuit T. V. Seminar Program on Rheumatic Fever. Such telecasts can be aimed at postgraduate and at lay education.

by the audience was a panel discussion of one subject. A survey of the lay public revealed that less than 1% saw the telecasts, rating them too technical but interesting and not objectionable.

The second series was analyzed to determine audience reaction and to what extent the viewer could increase his knowledge through these clinics. By means of a mail quiz sent to all physicians in the reception area, it was learned that viewers could answer 20 to 25% more questions correctly than the nonviewers. Kinescope recordings of the last series have been the basis of 43 telecasts by various stations in the U.S. In view of the facts presented, it can be said that the Postgraduate Television Clinics were very successful. Being considered is the possible resumption of the presentation of this series on Utah's educational television station, KUED, which will go on the air December 15, 1957. At any rate, it is certain that the College of Medicine will make maximum use of this new station under construction on the campus. Plans have not crystallized yet but it is expected that much will also be done in the field of lay education in public health and preventive medicine. (Figure 2).

Figure 3. View of the Audio-Visual Seminar Kit of recordings, slides, viewer and script.

AV Kits

The second method of communication announced was the Audio-Visual Seminar Kit. This program is being maintained and expanded. The AV kit consists of an attractive sturdy shipping box containing a medical discussion on long-playing records, a printed script of this same message, a set of appropriate color slides and a table viewer upon which they can be shown. The original four topics were available to physicians of Utah without charge except for shipping costs. An additional charge of $5.00 is made out-of-state users of these kits. The topic list has been increased to ten. Usually five duplicate kits of each topic are made to permit prompt supply to demands which come from physicians at home and abroad. (Figure 3).

Dr. Robert S. Warner, our former director, subsequently assistant director of THE AMERICAN HEART ASSOCIATION, later undertook a similar approach in the production and sale of Cardiac Clinic Kits and later, Cardiac Clinic Albums.[5] This program resulted in the distribution of over 200 kits and albums to individuals and local societies. Also as an outgrowth of the Utah program other organizations have used the same method of teaching. I believe the University of Minnesota College of Dentistry provides such a tool for the use of their students.

Semiautomatic Slide-sound Stories

Although we in the division of Medical Illustration are usually concerned

with means of medical teaching and communication, we have recently utilized an exciting and original technique of another department meriting wider attention. In the office of the Director of Placement at Utah, there has been an ingenious development in the audio-visual field taking place during the last few years. During his twenty years as the director of graduate placement, Mr. Herald L. Carlston, many times wished for an effective and inexpensive means of communication between the employer and the prospective employee. It is true that business firms had much printed material available for this purpose. But this is a very impersonal approach. In order for the larger firms to more effectively compete for the graduate's services, motion pictures were made at considerable expense for telling their story. This method is costly to set up and too rigid to maintain on a current basis. The most effective practice is the sending of the company representative to interview the graduate and attempt to sell him on the advantages of their firm. This, of course, is the most personal of all methods and will always be in use.

However, in supplementation, Mr. Carlston has pioneered a program which has met with enthusiasm from many in the business world. It is the first use of the slide-sound story in a program of job placement of graduates. It works like this. An employer sends to his office here a story of the company's attributes recorded on a magnetic tape accompanied by a group of appropriate 35mm color slides. An interested student may hear and see the features of the organization represented. Slide subjects and order are flexible.

Two grants have been received for the furtherance of this program. Interest has been great enough to invite its being described at national conventions such as those of the National Manufacturers Association, American Management Association, insurance companies and others. At present many story tapes and approximately 11,000 slides are on file. Within a year it is hoped the number of slides will be increased to about 100,000. (Figure 4).

The basis of the system is the automatic slide-sound recorder and projector combination. The commentary is recorded on a standard magnetic tape, as well as the inaudible signals which actuate the projector in controlling the projection time of each slide. The commentary alternatively may be recorded upon any recorder using a standard

Figure 4. (a) View of the job placement office at the University of Utah with growing file of slide-sound stories from hiring companies. (b) Presentation being made to prospective employees.

width tape. The tripping signals, however, must be impressed by the same automatic-type recorder.

This method should be helpful to hospitals in the recruitment of nurses, internes, residents, etc. Could it not also be used by medical centers and colleges to tell of their features and advantages to students, technicians and employees.

As well as using this method in helping to place graduates, the placement office is developing a program to acquaint prospective students with the advantages of attending college at the University of Utah. Slide-sound stories are being prepared telling the story of the individual departments such as metallurgy, pharmacy, elementary education; also, careers for women, etc.

At the College of Medicine interest is being shown in the development of various programs based on the use of this system. The Division of Medical Illustration is always interested in promoting the use of photography and illustration in increasing the efficiency of teaching in any area with which we are concerned. We have introduced the use of the slide-sound stories in the teaching of self-care to the patient. For example, a newly diagnosed diabetic patient must learn to adjust to an entirely different regime. This is a good way to teach him what his condition is in

Figure 5. Scenes from a semi-automatic slide-sound story prepared for polio patients. (a) showing a myographic test, (b) patient in Hubbard tank, (c) patient being given pulsator treatment, (d) patients during rehabilitation. (Photographs made from 35mm color transparencies)

terms easy for him to understand. With well planned illustrations he can be shown what his daily living habits must be—his diet, his self-administered medications, treatments, etc. With facilities in the out-patient department any number of persons can be given the information at one time. A well written and edited discussion on a tape can do a thorough, accurate and effective job. The tape won't forget a salient point and the illustrations leave a vivid lasting impression of important information. The same series of slides with another tape can be used for seminars or conferences or to teach medical students how they must instruct their future patients. Several pilot slide-sound stories like Figure 5 have been initiated.

Other departments are planning early trials of this form of communication. We propose to use it in the field of psychological testing. Here we feel that it can serve a good purpose where visual images must be accompanied by certain audible information or questions. It would standardize the timing and amount of information given. One anatomy instructor feels it could be well used as a method of giving examinations when recognition is the criteria for grading. We enthusiastically expect review programs and other applications to be of great value in conserving professorial time.

The production of a slide-sound story parallels that of producing a motion picture. A well written script available before the beginning of the photography is a real advantage.

In demonstration, two slide-sound stories have been selected for appraisal by the members of this Symposium. One is a story within a story on the use of the technique in the placement of University graduates. The second is a story prepared for polio patients. During its 16 minutes of running time the latter utilizes 73 illustrations including titles, reproductions of photographs and anatomical drawings as well as pictures of patients and equipment. A professional touch, which has commanded the attention of the listener-viewer, is the use of a professional narration and a musical background for the titles and the conclusion. The use of color film, of course, has the usual advantage of appeal. The subject is more effectively introduced by means of title slides.

In conclusion, the University of Utah College of Medicine finds that certain audio-visual techniques are very valuable teaching tools, particularly in the field of postgraduate medicine. Also of paramount importance is a well organized program employing to the best advantage all available equipment, materials, personnel and sources of information. Then with this as a basis new techniques should be tried and adopted when found to be effective.

Acknowledgment:

I should like to recognize the assistance of Chester A. Swinyard, M.D., who wrote the polio story script; Mr. Herald L. Carlston for his technical assistance; Rex L. Campbell, Acting Director of Radio-Television Production, narrator; and G. Julian Maack, BPA, photographer.

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Organization of the Medical Illustration Service in the Veterans Administration

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Objectives — primary principles — major organizational segments — scope — education and experience backgrounds of personnel — salaries — functions of Central Office — utilization of end product.

PHOTOGRAPHY performs unique and significant functions when it is applied to the problems of communicating information. This is particularly true in medicine and in other branches of science where clear delineations of physical phenomena and complex concepts are required. In the Veterans Administration, medical illustration fulfills these requirements by combining photography with other related practices. Here, medical illustration is thought of as planned communication. It is a vital process wherein the specialized skills of illustrators and physicians are blended to produce comprehensive, concise, and realistic expressions of medical information.

Medical illustration's contributions to education and research are fairly obvious. Also easy to recognize is its value in providing a natural and dignified way for medicine to publicize its achievements. Patients realize direct benefits when medical illustration is employed as a diagnostic aid, particularly through the use of photography in making permanent records of fleeting impressions, and in recording phenomena that are invisible to human sight. Medical illustration's influence on recruitment is a value in still another direction, for physicians and scientists in related fields usually prefer to affiliate with institutions where medical illustration services are available.

Our concept of medical illustration embraces all types of audio and visual aids used in medicine and allied branches of science. Included among such aids are a host of things such as drawings, paintings, moulages, models, charts, graphs, still photographs, motion pictures in monochrome and full color, sound recordings, television, and similar devices. All of these are used individually or as collections for study, teaching, research, demonstration, documentation, publication, and exhibition. The Veterans Administration considers medical illustration to be a necessary requirement and an integral part of a full scale medical program. Accordingly, a Medical Illustration Division was formally established in the Department of Medicine and Surgery during reorganization of the Agency immediately after World War II.

Organizationally, the Medical Illustration Division is located in the Educa-

tion Service, which is a part of the Office of the Assistant Chief Medical Director for Research and Education. From its beginning, the Division has been blessed with a high degree of freedom from administrative restraint. In addition, its aims and purposes have always been strongly and sympathetically supported. It is, then, not particularly startling to discover that the Veterans Administration supports the largest medical illustration program known to be in operation.

Our assigned objectives (or functions) are to:

1. Provide for the medical illustration needs throughout the Veterans Administration medical program by formulation and administration of policies and procedures governing the content and utilization of audio and visual medical aids.
2. Develop medical illustration programs and projects, in cooperation with concerned professional staffs, to stimulate interest in medical research, and to increase the effectiveness of medical training programs, meetings, publications, scientific exhibits, and related activities.
3. Provide plans for the training of specialized medical illustration personnel.
4. Plan, install, and administer medical illustration laboratories, primarily to meet the needs of field stations.
5. Plan, install, and administer programs for the preparation and utilization of medical films and scientific exhibits.
6. Insure coordination of medical illustration activities with all concerned organizational elements in the Veterans Administration, and maintain liaison with outside groups concerned with medical illustration activities.
7. Provide for and stimulate research and development in the field of medical illustration.

Our experience leads us to believe that the surest and simplest way to achieve a successful medical illustration program, regardless of its size, is through unswerving observance of primary principles. The most important of these are embodied in the following six partial definitions:

Successful medical illustration is:

1. *Communication*, an active process involving interaction between people. No medical illustration is a completed illustration until it has been used in the process of communication.
2. *A service* which promotes and supports all other elements of good medical practice. It is not an end in itself.
3. *Team work*, characterized by the cooperative contributions of the physician and the illustrator toward the solution of a communication problem. The "lone wolf" in medical illustration is plagued with failure and frustration.
4. *Planned*. Successful illustrations are designed and produced to satisfy expressed needs. Planning provides for successful procurement and distribution of resources (men, money, materials, etc.). Without planning, there is chaos.
5. *Varied*. All media and their associated skills which lend themselves to the creation of visual and aural impressions are included in medical illustration. A medical illustration department which offers just a single service such as photography, or art, or sound recording, or film distribution is not complete.
6. *Readily available*, with its services equitably distributed within the organization it serves. Irregular, meagre service from a medical illustration department destroys its value

This is by no means a complete listing of all the concepts underlying a successful medical illustration program. More could be added, some could be argued, and refinements could be introduced, but these six form a hard core around which a far better than average organization can be formed and acceptably maintained. In the Veterans Administration, they are at the heart of all medical illustration activities, and their influence pervades the whole program.

Functionally, there are three major segments in the Veterans Administra-

tion Medical Illustration Division. They are concerned with the Medical Illustration Services in field stations, with scientific exhibits, and with medical films, respectively. These three segments are natural divisions, each of which contains a group of related functions. Formal organization and division of work are based on these functional groupings.

In the Central Office, there are four people, two supervisory administrators and two secretaries. The Chief of the Division is responsible for the total program and also for detailed management of the medical film segment. The Chief of the Medical Art and Photographic Section is responsible for overall management of the Medical Illustration Services in the field, and for detailed management of scientific exhibits. In accordance with general Veterans Administration policy, there is delegation of authority as deep as possible in the organizational hierarchy. Ideally, the role of Central Office is policy formulation and program guidance. There are, however, practical limitations, and some operational activities are located in the Central Office. The chart shows those organizational elements regularly concerned with medical illustration activities.

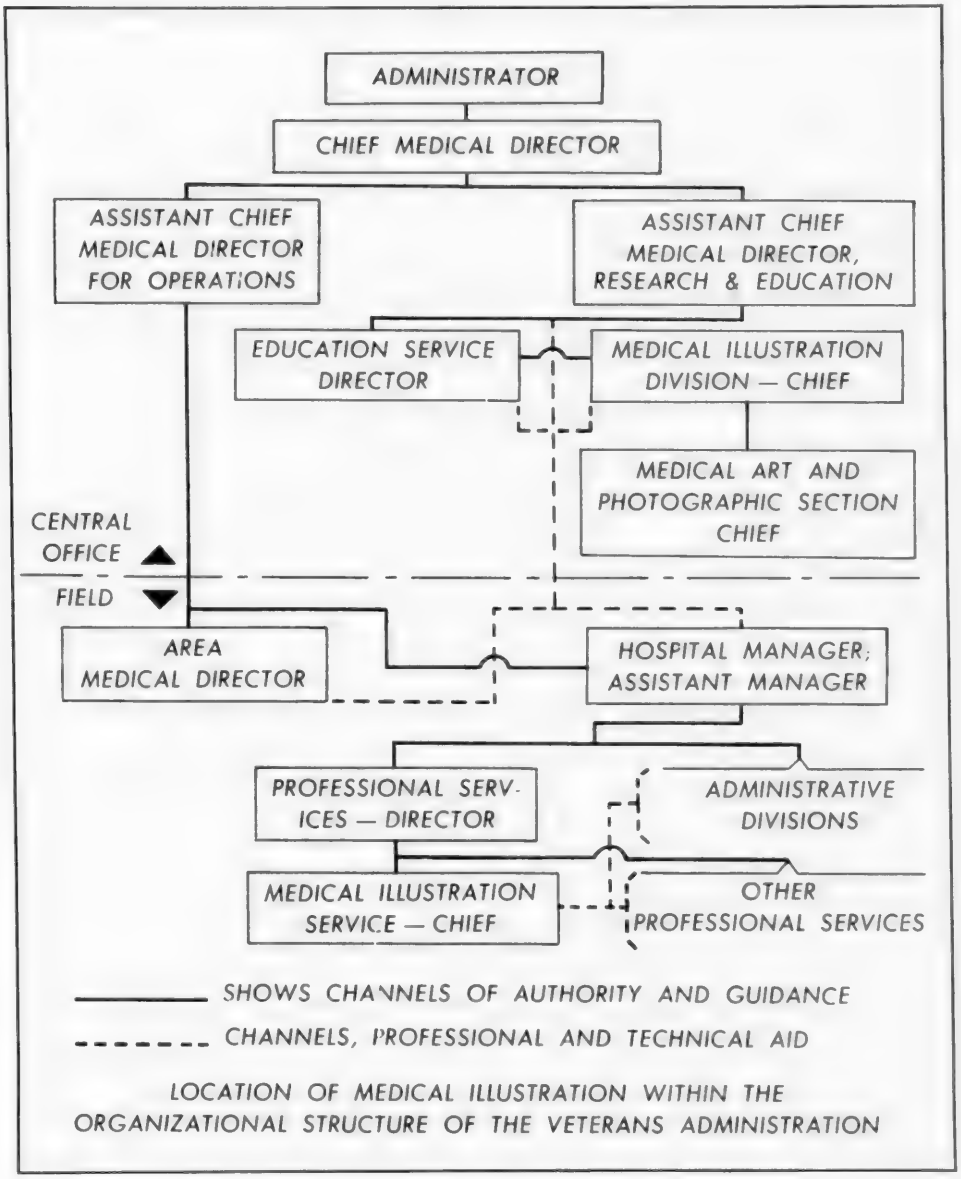
Medical films and scientific exhibits shown at national meetings, or otherwise widely distributed, are generally considered by their viewers to represent the whole Agency. Because of this, we are concerned whether or not such films and exhibits conform to Agency-wide policy. Consequently, central approval of films and exhibits is required prior to national showings. For local showings, no effort is made to control the distribution of medical films and scientific exhibits within the sphere of influence of their place of origin. Medical Illustration Services in the field are almost completely decentralized. Quarterly reports of activities are required, however, and various other program review devices are employed so that an equitable distribution of resources can be made.

During the Fiscal Year 1957 (July 1, 1956, through June 30, 1957), organized medical illustration activities were conducted in 83 hospitals with formally established Medical Illustration Services, and in 6 additional hospitals on an informal, part-time basis. In these 89 hospitals, 196 full-time and 12 part-time medical photographers, medical artists, and clerical personnel produced 143,000 photographic negatives; 381,000 prints; 141,000 transparencies; 85,000 feet of edited 16mm motion pictures; and 12,000 pieces of medical art work. These products were prepared primarily for local use, but they are also employed on a wider scale in exhibits, in motion pictures, and as loan collections that can be used throughout the Agency.

Personnel Qualifications

A brief examination of the qualification standards for medical artists and medical photographers offers some insight into the selection process. The education and experience requirements for both of these specialized groups were developed by the Veterans Administration in collaboration with the United States Civil Service Commission, and are established by the Administrator of Veterans Affairs under authority of Public Law 293, 79th Congress. They are administered by the Veterans Administration.

Initial education and experience requirements for medical artists and medi-



LOCATION OF MEDICAL ILLUSTRATION WITHIN THE ORGANIZATIONAL STRUCTURE OF THE VETERANS ADMINISTRATION

cal photographers in various grades are indicated in the following excerpts from the U. S. Civil Service Examination Announcement No. 439(B), as amended to reflect the currently effective salary adjustments of 1955[1]:

Scientific Illustrator (Medical)

	Annual Salary		Minimum Years of Experience Required	
Grade	Basic	Maximum	General	Specialized
GS-5	$3670	$4480	2	1
GS-7	4525	5335	2	2
GS-9	5440	6250	2	3

The *general experience* must have been progressively responsible experience in creative art. (Specialized experience in excess of the required minimum may be used in lieu of general experience.)

The *specialized experience* must have been in medical art work which required a knowledge of anatomy and which included making medical and surgical illustrations for publication and exhibition in monochrome and in full color, and by means of line and continuous tone.

For grade GS-9, the applicant's medical and surgical illustrations must have been difficult and original. His experience must demonstrate that he possesses the ability to direct other Scientific Illustrators (Medical) in the completion of assigned projects.

Successful and progressive study in a medical art school offering a two- or three-year course in medical art work may be substituted for experience on a year-for-year basis up to a maximum of three years.

Medical Photographer

	Annual Salary		Minimum Years of Experience Required	
Grade	Basic	Maximum	General	Specialized
GS-4	$3415	$3925	1½	1½
GS-5	3670	4480	1½	1½
GS-6	4080	4890	1½	2
GS-7	4525	5335	1½	2½

The *general experience* is experience in still or motion picture photographic work. (Specialized experience in excess of the required minimum may be used in lieu of general experience.)

The *specialized experience* is experience in medical photography.

For grades GS-6 and 7, the specialized experience must have included: (1) responsible activities in a still or motion picture photographic laboratory, or (2) planning and completion of very difficult still or motion picture work of high quality. For grade GS-7, the specialized experience must have included photomicrography or motion picture photography.

Certain types of education and training may, after evaluation by the examiners, be substituted for experience within established maximum limits.

The Veterans Administration also employs medical photographers in grades GS-8 ($4970 to $5780 per annum) and GS-9 ($5440 to $6250 per annum), but positions in these grades are usually filled by promotion from within the Agency.

The number of people employed in individual Medical Illustration Services in Veterans Administration hospitals varies from one to eight, with corresponding variations in the types and completeness of the services provided at each hospital. A well known medical artist has stated that a medical illustration service must have medical art to be complete, but without medical photography, it cannot survive.[2] About one-third of our Medical Illustration Services employ medical artists, and slightly over half employ clerical personnel, but each of them has at least one medical photographer. This distribution of specialized skills is not the result of any artificial control, but represents a natural balance between expressed needs and available resources. It marks the importance of photography.

For the Fiscal Year 1957, the average salary of VA Medical Illustration Service employees (all categories included) was $4490, with a range from $657, (for part time) to $6385. The average cost of personal services per Medical Illustration Service was $10,492, with a range from $657 to $38,015. Exclusive of salaries and overhead, the average operating cost per Medical Illustration Service was $3932, with a range from

$1000 to $27,114. Information on overhead costs is not available.

Organizationally, our Medical Illustration Services are placed under the Directors of Professional Services of their respective hospitals. This is done because we feel that medical illustration should be associated as closely as possible with the professional aspects of medicine, and also because the Director of Professional Services supervises all of the professional groups served by medical illustration. When the Chief of the Medical Illustration Service is faced with professional medical judgments and administrative decisions beyond his authority or ability, he turns to the Director of Professional Services for guidance. In some of our hospitals, a local committee, composed of members of the hospital staff, exercises over-all control of illustration activities.

Utilization

The Veterans Administration has an active scientific exhibit program. During the Fiscal Year 1956, there were 187 presentations of 101 discrete scientific exhibits at 110 medical meetings.

The Medical Illustration Division's many responsibilities in connection with various scientific exhibits are concerned with planning, coordination, liaison, and utilization. These functions are performed in the Central Office. However, most of the illustrations used in these exhibits represent re-utilization of illustrations originally prepared in our Medical Illustration Services in the field. In addition to the centralized program, numerous exhibits are prepared and used in the hospitals where they originate. When any of these are selected for showing at national meetings, they become subject to central control.

The medical film program in the Veterans Administration is undergoing a shift of emphasis. Until recently, medical motion picture production was largely a centralized program. Attention was focused on informational areas where there were known needs for teaching films. A substantial number of films and film series produced under this plan have been well received and widely used during the past decade.

In recent years, however, there has been an increase in the production of medical films which are shorter and more simply conceived. Most of these fit into two general categories which we think of as reporting films and technique films. The reporting film places less emphasis on the slowly changing, basic concepts and more on research and the newer, less completely tested ideas which are subject to modification as they become more widely known. The technique film emphasizes ways of doing things and often is a fragmentary showing of a more complete concept.

For several reasons, reporting and technique films are well suited for production by the Medical Illustration Services in our hospitals. Their structure is relatively uncomplicated and requires a minimum of optical effects. They do not require large expenditures of time or money to attain maximum usefulness.

An imaginative medical illustrator, with basic motion picture equipment and some training in cinematic sense and techniques, can produce highly acceptable reporting and technique films. Furthermore, these films achieve greater acceptability and usefulness when they are produced at the hospitals where they are needed.

This shift of emphasis in our medical film program has sharpened our awareness of the need for supplementary training in motion picture planning and

production. A series of annual medical film workshops has been projected to help satisfy this need. The First Medical Motion Picture Workshop, held on the Calvin Company's Kansas City sound stages in February 1957, covered the overall aspects of medical film production. This, we hope, may be followed by additional workshops dealing with more specific, restricted areas of medical film production.

Other training needs have been met through supporting the attendance of our medical illustration people at specialized courses offered from time to time by commercial and educational establishments. Also, we take advantage of our own well-qualified people through arranging for those who need training to receive it on a preceptorship basis in our Medical Illustration Services.

One more function, medical film utilization, deserves mention. There is maintained in the Central Office a film library in which the Medical Illustration Division deposits prints of medical films known to be of value in various training programs. At present, the film library has about 3,000 prints of medical films, representing some 310 titles, all of which are available on a free loan basis to our hospitals. In addition, the Division contributes financial and informational support to the Film Reference Guide for Medicine and Allied Sciences. This is an inter-agency publication prepared by the Library of Congress for the Interdepartmental Committee on Medical Training Aids, on which the three Armed Services, the Public Health Service, and the Veterans Administration are represented. The Guide contains the titles, descriptions, and references to the distributors of numerous films. Each film listed may be borrowed according to its distributor's terms. Some require payment of rental or service charges, but for many of them there is no charge except for return transportation. No references to films for sale only have been included.

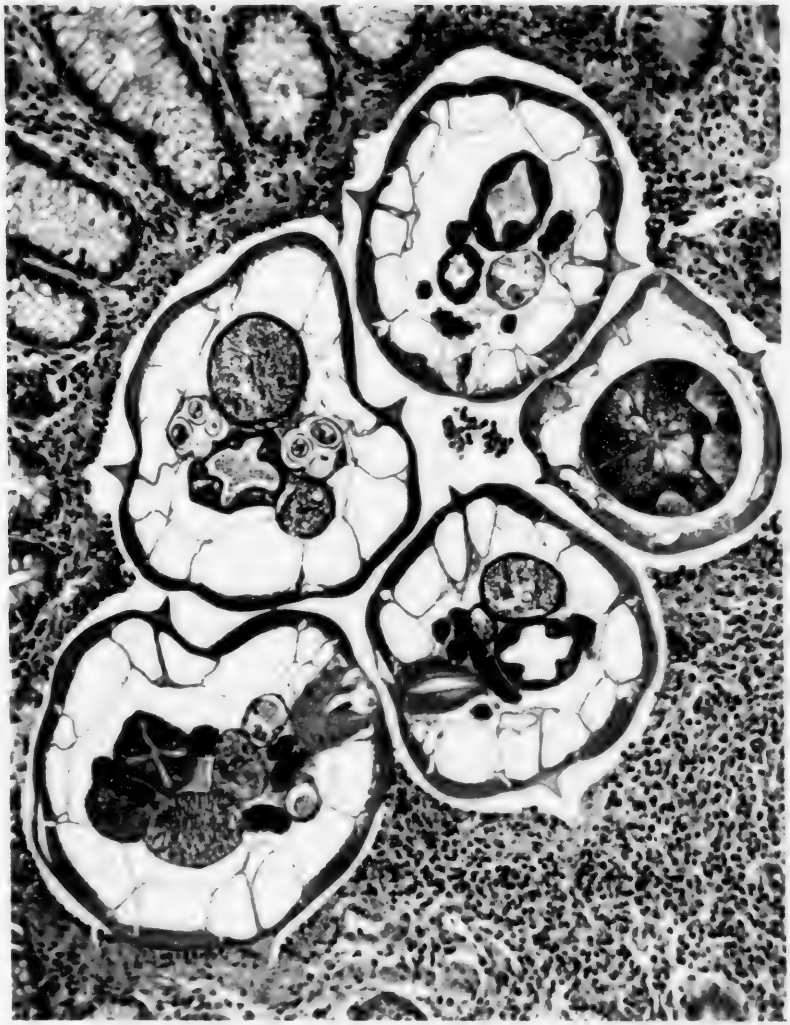
The June 1957 issue of the Guide, now current, has about 1,850 medical film entries. The next to be released in 1958, will have over 2,000 entries, and will supersede the current issue. Revised issues, reflecting such changes as the Committee directs, will appear annually. Each of the five participating agencies distributes the Guide to its medical installations. The Library of Congress sells copies to the public.[3]

This review represents Veterans Administration thinking on medical illustration, what we believe should be done about it, and how we have attempted to do it. Most of the operational details have been omitted because these rarely are the same in differing situations. Instead, more emphasis has been placed on principles and ideas for these govern our approach to medical illustration.

[1]*Civil Service Examination Announcement No. 439 (B) for Scientific Illustrator (Medical) and Medical Photographer;* issued November 30, 1956; no closing date. Available from the Executive Secretary, U.S. Civil Service Examiners, Veterans Administration, Washington 25, D.C.; U.S. Civil Service Regional Offices; and most U.S. Post Offices.

[2]Remark made in 1947 by Elon H. Clark, Professor of Medical Art and Photography and Director of the Medical Illustration Division at Duke University, while a guest at a meeting of the Board of Chief Consultants to the Chief Medical Director of the Veterans Administration.

[3]*Film Reference Guide for Medicine and Allied Sciences* by the Interdepartmental Committee on Medical Training Aids. Available from the Card Division Library of Congress, Washington 25, D.C., at approximately 65¢ a copy.



Pin Worms

Anthony M. Kuzma

Certificate of Merit

Journal of the Biological Photographic Association Vol. 25, Nos. 1 and 2 February-May, 1957

Economics of a Biological Photographic Department*

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Facing the student load — rationale of photographic visual aids — functions of a versatile illustration laboratory — mental aids — methods and equipment — economic factors.

SINCE its inception 27 years ago, the Biological Photographic Association has kept its Members well informed on technical advances in biological photography. There is now another aspect that is coming in for increasing attention. It is the efficiency of photography in teaching programs and the economics involved. Thus, the progressive biological photographer has to be more than a specialized technician. He has to be ready to advise the educator on the relative effectiveness of the varied photographic records in teaching procedures the latter plans, and to work out their practical adaption.

BPA Members must know their product and learn to sell it. Users of biological photography can then "buy" more effectually. An administrator appreciates the chance to personally evaluate the intelligent presentation of the pros and cons before acceptance.

This paper will deal with the illustration needs facing dental education at the University of Minnesota and some of the methods the Dental Illustration Laboratory employs to sell its photographic services there. The Author has also had several worthwhile discussions with A. Orville Dahl, Ph.D., Professor and Chairman, Department of Botany, and Dwight E. Minnich, Ph.D., Professor and Chairman, Department of Zoology. He is most grateful for their help, because it confirms the fact that all fields of scientific education are faced with similar needs. Also, it has made possible the inclusion of viewpoints outside the field of dentistry and thus saves this paper from appearing too restricted.

ADVANTAGES OF PHOTOGRAPHY

The problem is one of providing the most efficient use of instruction time to train an ever-increasing student load. The word student is used here to include undergraduates, post-graduates, continuation workers, and professional men attending study clubs or who request educational material for use beyond the University. Reference to the thinking of other investigators will define the challenge.

Role of Photo-aids

It is generally agreed, among educators,

> "that a new approach to the curriculum and teaching methods is required at all levels. Waste must be eliminated wherever it occurs. Economies can be made that will

*Based on a paper presented at the 26th Annual Meeting of the BPA in Rochester, New York, 1956, and an Addendum read at the 1957 BPA Symposium.

improve rather than weaken the quality of the education program."[1]

"Giving information, explaining, is a part of teach ng. Over and over again, teachers are inefficiently using their energy to say the same things. They patiently repeat the same explanations, perform the same demonstrations, use the same words — words without pictures that too often convey little or no meaning."[2]

In the field of dental education one of the repetitive tasks is a procedural demonstration. Instructors have found that with a motion picture the information can be presented to the entire class of 100 more effectively in one regular lecture period than in 10 demonstrations for 10 groups.

To examine the foregoing point in regard to economy of time we will assume than an average demonstration requires an academic half-day of 3 hours. Therefore, one effective motion picture can equal 30 hours of instructor's time plus the often overlooked factor of 300 hours of student time.

Let us examine some of the methods being used to impart information to students. As a start, consider the instructor who presents his information with verbal symbols only. Here we have a person talking at an average speed of about 125 words per minute while the average student is conditioned to think at approximately 4 times that rate. Because it is very difficult to try to slow down thinking speed, a student therefore has approximately 400 words of thinking time per minute to spare for mental side excursions.[3] In addition it has been established that, on the average, the comprehension or immediate recall of material presented in this form is 68 percent.[4] Two months after listening to a person talk, the average listener will remember only about 25 percent of what was said.[5] This communication method is responsible for the waste of literally thousands of instructor-student hours.

Regarding the value of audio-visual aids for teaching, Knower, Phillips, and Keoppel found that the addition of even relatively simple drawings presented with a lecture produced a greater amount of recall than lectures presented without these visual aids.[6]

VanderMeer's study suggests that a body of factual information may be taught by films alone almost as effectively as by a teacher using conventional classroom methods without films. Furthermore, films introduced and supplemented by brief study guides are even more effective.[7]

While most schools today are using audio-visual materials, it is nevertheless true that there is a wide divergence in their effective and efficient use. This is further complicated by oftentimes haphazard audio-visual procurement methods. Thus, the illustration laboratory can not only produce such material but also can be alert to the nature and value of existing aids available from other sources. Sometimes the material can be purchased and re-edited by the teacher and photographer. The majority of these are motion pictures, but criteria for judging effectiveness is universal.

Return now to a classroom where the instructor is aware of the value of well-chosen audio-visual teaching aids. Chalk boards are available for the use of virtually all instructors. Chalk board use, in addition to verbal symbols, has proven to be more effective than verbal symbols alone.[8] However, we are faced with pictorial quality ranging from very poor to fair and only in rare instances can it be classified as good. The fact that a series of drawings must be remade each time a lecture is given predisposes this method to being inefficient

although more effective than not using it at all. Flip and flannel boards are also useful but are often limited by size.

Most present day educators have accepted the proven value of audio-visual aids such as lantern slides, film strips, and motion pictures. In a deplorably large number of instances there has been only cursory provision by the school administrator to supply needed equipment and materials. This leads to the situation in which the conscientious instructor must purchase his own equipment and supplies to provide teaching material. This procedure undoubtedly results in less effective and efficient teaching quality. It also results in highly erratic photographic quality as evidenced by some of the presentations at almost any scientific meeting. The institution suffers further from this procedure three ways: namely,

(1) Lack of interdepartmental availability of the teaching material produced,

(2) Lack of necessary quantity of material produced, and

(3) Loss of educator's time while producing this material.

Until the time should come when biological photographers are paid at the same rate as associate professors, the institution is paying a high premium for its photographic work in salary alone. This is discussed in detail further on.

There are other photographic service factors to consider; for example, published illustrations.

> "While it is true that much of the material which appears in such journals is a result of careful scientific work, it also is true that some of it may be inaccurate and misleading. A critical evaluation of an article should be made, therefore, before the reader accepts it as authority."[9]

Evaluating Teaching Films

Fortunately we were early directed to the publications from the Instructional Film Research Program at Pennsylvania State College. For a number of years this program has carried on a series of projects designed to discount or substantiate what has formerly been opinion in the field of teaching film utilization. These were scientific projects excellently carried out and this writer recommends investigation of their conclusions by anyone engaged in motion picture production and use. The projects covered a wide variety of subjects concerned with motion picture production and use ranging from the effectiveness of films for instruction, consistent use of films in instruction, correct camera angles, rate of development of the story of the film, the amount of commentary to be used in a training film, to the use of special effects and optical effects, and stereoscopic films.

One of these projects, of special interest to us as producers and users of photography, set out to determine what gain in teaching effectiveness can be obtained by employing the more costly color films for training. Six hundred and ninety-one students were given training by films; half saw color films and half saw identical films in black and white. Tests were given to discover differences in the learning of the two groups. The results showed that both films produced learning and that there was no greater learning from the color films. It was also shown that while the information presented in the color films was remembered longer and color films were liked better than black-and-white films, the subject content had a greater effect on the liking for the film than the impacts of black and white or color. As a result the recommendation from this study states "*Training films should be produced in black and white because the increased cost of color film is not*

offset by increased learning. . . . . "[10]

This conclusion does not apply carte blanche to slides, because quite often the use of color removes the need for making a delaying mental translation in recognizing a condition. (See Plate III, page 81.) Morphological changes, Figure 1, in slides and procedural demon-

Figure 1. Above (a), the pre-treatment photographs indicate the desirability of orthodontic treatment. Below (b), post-treatment photographs record changes in the external appearance. Black-and-white photographs serve to depict morphological changes.

strations as the subject of motion pictures, usually do not call for the use of color. Of course, if an application of color is part of the story, Figure 2, it is better to utilize color photography where practical. Obviously, a BPA Member with a practical perspective in such matters makes his department a valuable asset to his administration from an economic standpoint.

Figure 2. Use of stereo slides for reference in color needed in making moulages.

Due to the scarcity of factual published infirmation concerned specifically with science motion picture presentation at the college level of instruction, the School of Dentistry at the University of Minnesota undertook a study two years ago concerned with the evaluation of effectiveness of content in our own motion picture films. A class of students was divided into three groups and these groups were equated according to their college aptitude rating. Group one was shown a selected training film. Group two was given the demonstration shown in the film, and Group three was given both the demonstration and the motion picture film. All groups were then subjected to the same specially prepared examination and the results were evaluated to determine the best teaching method. At this time we do not feel that we have enough data to demonstrate significantly that any one of these methods is better than the other two. Yet they do already show that the use of films is not less desirable than an actual demonstration. This particular research, of course, was not aimed at comparing the efficiency of providing for and giving the two types of instruction, assuming equal effectiveness. We feel that the capability for making such determinations can be included in the advantages of having an adequate illustration facility.

The investigations presented emphasize that the methods covered are justifiable and logical means to an end. That end is the ability to isolate and reproduce reality, selectively utilizing any of the audio-visual "aids" wherever they are applicable to the effective communication of knowledge. There is one other aspect which calls upon the proficient photographer's training, and that is the impact of dramatization. Here an article "The Teaching Film of Tomorrow" by Robert W. Wagner is quotable.[11]

> "The necessities of modern education have given rise to the concept that good teaching technics may be built directly into films designed to meet the emergency requirements of rapid massed learning. While good utilization by a capable teacher improves the chances of learning from a motion picture, a good film can often do a better job than a poor teacher. In the past it has been possible, where necessary, to impart information and to develop fundamental appreciations and understandings through books alone. The teaching film of the future may be expected to function in classroom situations where qualified teachers are not available, or as in the case of some adult programs, where there may be no teacher at all. The educational importance of the three dimensional film, or the wide screen picture with stereophonic

> sound, for example, may not be in terms of what is currently advertised as 'greater realism' but rather in greater symbolism. By amplifying and extending reality, these technics may make the film experience more 'real' than real, throw new light on the commonplace, and capture the deeper significance of the situation or event. The basic importance of a good motion picture has always been that while it cannot substitute reality, it can isolate and intellectualize meanings not always evident in a firsthand experience."

All teaching films produced by this laboratory are complete with sound narration. Our decision to produce only sound films was supported by investigations conducted by Nelson and Moll.[12] Most of our training films are purposely planned so that they will not exceed a showing time of 15 to 20 minutes. On a practical basis this allows for repetitive showing of films during a single class period, a method of training film use based on an investigation conducted by McTavish.[13]

The illustration laboratory should also be presponsible for recording and transcribing the narration of its motion pictures. A recording service can be maintained for lecturers desiring to evaluate their presentations by "listening to themselves talk." Again the value of a fully capable facility is clear.

Other Services

Versatility of the photographic service must not be overlooked as an advantage. Briefly, the immediately apparent records are slides, prints, and motion pictures. However, to these must be added moulages and exhibits for departmental use and meetings. Then there are skills needed in reducing data to good visual form, and this is an occupation in itself.

The photographer can help the authors in the institution to check the quality of their published reproductions. Good showmanship can be fostered in many presentations. Then, practical suggestions on laboratory and field (Plate II, page 20) equipment are within the scope of economic and facile operation. All these indicate that the proficient biological photographer is not merely a finger-stained technician.

Biological Sciences

While our activities are primarily dental, the points made apply equally to the general biological field. A few random examples will perhaps emphasize this. In teaching zoology how else could one possibly acquaint students with the size, shape, color, and living movement of exotic marine animals which comprise a vast proportion of the animal kingdom. The ability of motion picture photography to compress time makes it particularly suitable for the demonstration of certain kinds of animal and plant activities which occur seasonally. The entire life cycle of an insect or a fish or the hatching of a chrysalis can be shown within a class period regardless of the season. Laboratory and field subjects can be shown over and over again by photography. Photographic recording of the effects of vitamin and hormonal deficiencies and excesses may be dramatically presented. Certain areas of instruction cannot be covered effectively by any means other than photography; the instructor responsible for the teaching of the story of human reproduction to a Freshman Class will readily agree.

Although surgical operating room photography is dramatic, there are uses in other fields of biology of equal importance. In using phase contrast photomicrography the botanist or zoologist can follow the course of mitochrondria and other cytoplasmic inclusions in

either living or freshly collected material, which is neither stained nor fixed, and record continuous changes in cellular structure. Figure 3 is an example of photomicrography, using this technique, of two dissimilar pollen grains from tropical clover. The plants from which these pollen grains were taken are almost identical in appearance. To photograph the pollen in its living state it was placed in 85 percent lactic acid. It is not practical to have such a preparation on hand for each class; hence the resultant photographs become useful teaching material.

The ecologist needs photographs to record a community of organisms, both flora and faune, in a given geographical location. Taxonomic botanists use photographs to supplement line drawings for individual illustrations. Low power photomacrographs of cross sections, radial sections, and tangential sections are used for the identification of wood structure in botany and forestry. Interval photography, with its compression or extension of time, is the most dramatic method for studying growth, for example the root development of plants. In no other way can the dynamics of proliferation be brought home to the student so forcefully.

We have occasion to invade the field of metallurgy for many dental illustrations.[14] The manner in which an alloy solidifies governs its physical properties. Figure 4 is a metallograph depicting the flow of liquid around the grain boundaries in an overheated specimen. This results in a brittle casting. A photograph is the only practical way to show the condition to a large class for impressing upon them the care required.

The photographer as well as the educator is concerned in the implementation and use of TV instruction.[15, 16]. But this is beyond the scope of my paper.

The illustration laboratory is involved in first "selling" the effective use of photography. Then, it must produce the type of records needed. Economical methods and equipment must be devised and advised. The encouragement of widespread utilization of the material is also its function. In the following sections, these topics will be exemplified briefly by our own activities. Finally, the cost factor will be presented so that the reader may judge the value of such a program.

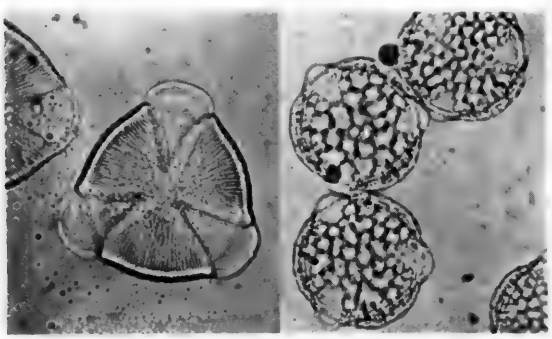


Figure 3. Living unstained pollen grains from tropical clovers. When not possible to obtain subjects for every class session, photography becomes extremely useful. (Courtesy A. Orville Dahl, Ph.D.)

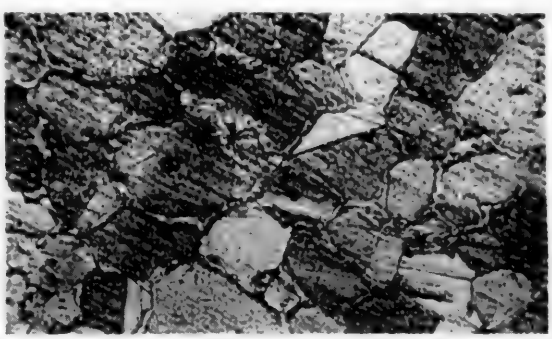


Figure 4. Overheated gold alloy specimen that was partially melted. Shows flow of liquid around grain boundaries before refreezing occurred. This impresses students with cause of brittleness.

TYPES AND USES OF PHOTOGRAPHY

One of the biggest projects of our dental illustration laboratory is maintaining a library of about 20,000 slides. These are cataloged and checked out to any member of the faculty. All the common uses of slides for teaching and lecturing are made. Many are produced from negatives so that the subjects are available for publication. In addition, new specific material provides for particular needs and then affords a means for expanding the general file.

Studying Small Areas

The uses of photographs as visual aids to teaching are too well known for necessitating a full discussion here. Yet, there is a special function in dental instruction that warrants noting. Many procedures are concerned with a small area in and about the mouth, if not concentrated on just one tooth. Accordingly, an instructor can demonstrate procedures in such a restricted field to a small group only. On the other hand, a series of slides or a motion picture can magnify this area many times and reach many students at one showing.

Before the advent of our motion picture program the instructional procedure might well have been as follows: The instructor would cut a preparation on a patient's tooth explaining each step as he went along to a group of approximately ten students. It was up to each of the students in this group to observe as best he could. The instructor would repeat this demonstration as many times as necessary for the entire class. Now, the instructor gives the demonstration before a cine camera, and as a result, the student can see a large motion picture of the demonstration in color with a far better continuous view than formerly and more than once very readily. Each student has a "chairside seat" and is able to gain the required information in a fraction of the time formerly required. This frees the instructor to give more personal supervision on other projects to the students he is teaching.

Special Uses

We plan to have our slides give the maximum versatile service, because the students themselves can make use of many of them. A projection booth with semi-automatic equipment will permit them to see selected lectures, accompanied with a recorded commentary, whenever they care to. Also, in the slide library, the cabinets are arranged on racks which can be pulled out in front of fluorescent illuminators, Figure 5 as shown.

The theses of graduate students are fully illustrated with photographs, charts, and graphs. These are supplied to them with no charge. Similarly, complete illustrations are furnished the faculty members for the manuals, papers, and textbooks they write.

All dental schools in the United States

Figure 5. The Slide Library provides the instructor with easy access to his lecture slides.

have access to our motion pictures. There is no rental charge made for this service other than transportation of the film. Also, we make copies of our films available to any dental school anywhere that might like to purchase them for use in their teaching program. We supply these copies to them for the cost price of the film. We have supplied them to dental schools in the United States, Norway, Sweden, England, Switzerland, Canada, India, Belgium and South Africa.

Mental Aids

There are about a dozen major divisions in the school, each with three broad fields of responsibility—teaching, research, and patient care. We can examine a specific use of photography by a few of these divisions, bearing in mind that these photographs serve the dual purpose of being both records and illustrative teaching material.

The Division of Orthodontics has found that comparison photographs permit objective study. Each patient admitted to this division for treatment has a profile, and a front view photograph as well as a third photograph showing the anterior aspect of the teeth in whatever occlusion the patient may be able to place them. Figure 1a shows a patient before treatment. Due to the protruding upper anterior teeth, she is unable to close her lips without strain. These photographs are made with a photognathostatic camera, which establishes a consistent patient-camera relationship over a period of years. To take the profile photograph the accepted horizontal plane (the Frankfort plane) is mechanically positioned in correct relation to the optical axis of the camera and lens. The front view is recorded, using the 2 orbital points plus the tragion to establish correct relationship of the patient to the lens axis. On the day the photographs are taken, cephalometric radiographs similar to Figure 6, are made in a cephalostat. Impression models as seen in Figure 7 of the upper and lower dental arches are constructed. Relevant material from the cephalometric radiographs is taken in the form of tracings which can then be superimposed and accurate measurements made of the changes in the patient. It can be determined if these changes were due to growth or treatment or both, and the extent to which these changes occurred. In Figure 8 the solid line demonstrates tooth relationship before treatment and the dotted line the tooth relationship after 2 years of treatment. This is also demonstrated photographically in the post-treatment pictures in Figure 1b. The procedure is duplicated when necessary during treatment.

In a similar fashion, the Division of Oral Surgery uses photography most effectively. For example, patients accepted for surgical correction of mandibular prognathism have intra-oral, and extra-oral profile and front view photographs made in both motion picture and still photography. Pre-operative and post-operative comparisons provide excellent demonstrations.

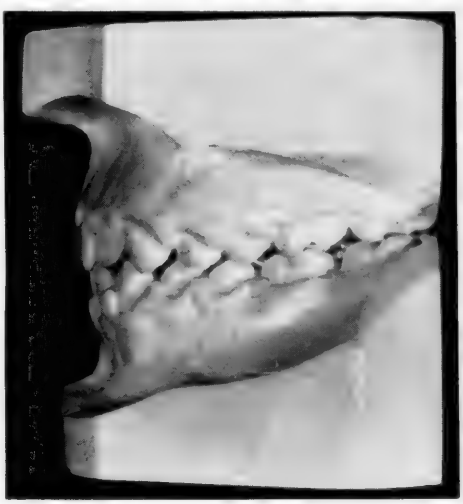
The administration is also furnished with duplicates of letters, records, and a host of other items which contribute to ease in running a complex institution. We have found efficient ways to produce many types of slides with the equipment entailed and thus obtain full benefit from the investment.

It is beyond the scope of this paper to go into detail on the hundreds of ways in which working photographs in the Divisions are put to use. The above examples serve to indicate the intensive

Figure 6. The pre-treatment cephalometric radiograph, showing bone, malocclused teeth, and over-lying soft tissues supplements photographs.

Figure 8. Combined tracings from cephalometric radiographs indicate accurate amount of correction. Photography produces the slides.

Figure 7. Pre- and post-treatment study models clearly demonstrate correction achieved. Photographs are easier to handle than models when a large number of cases are reviewed.



application typical in all. Thus, to the value of photographs and photomicrographs as visual aids in teaching, discussed previously, must be added their indispensability as utilitarian help for the professional staff.

OPERATIONAL ASPECTS

It is not the place here to go into the numerous photographic and photomicrographic techniques which are the concern of photographers in the department. The Journal of the BPA carries such articles regularly. However, the administrator, considering a photographic program, will want a rough idea of the space and equipment involved. The methods of organizing the distribution and circulation of the records will be of interest to him and to many photographers also. Then, an outline of the steps in preparing a motion picture will serve to indicate the caliber of the personnel needed in a progressive and effectual illustration laboratory.

To meet the problem of implementing the efficient production of illustrative material, the Department of Photography was called upon to devise a series of services, all integrated, that would be practical and freely used. A new Dental Illustration Laboratory was designed and completed in February of 1954. It is located on the same floor of the building as the Division of Oral Surgery, and the Division of Oral Diagnosis, thereby being readily accessible to the patients from these two divisions.

As will be noted in Figure 9, the air-conditioned photographic studio is of ample size to provide facilities for motion pictures, still pictures, and photomicrographic services. Adjoining the studio is a print darkroom, a film darkroom, and an office for consultation, administration, and record filing.

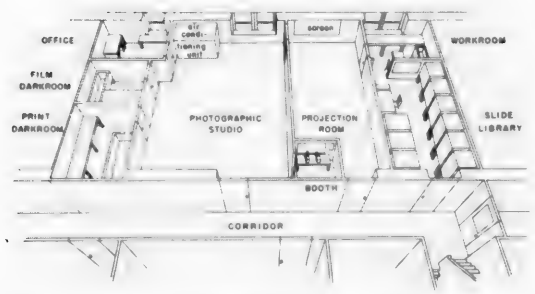


Figure 9. The Dental Illustration Laboratory. Compactly arranged for efficient integration of services.

The projection room is used for previewing, editing, recording, and for conferences. The workroom is where the artist makes sketches, drawings, models, and moulages. The remaining room is the slide library. Since costs change and vary it will not be too useful to analyze the expenditures involved: they can be currently estimated from the size of the facility diagrammed.

Our personnel complement totals 3. This includes a Senior Medical Photographer, a photographic assistant and an artist who also serves as slide librarian.

We are equipped with serveral ordinary cameras for black-and-white work and typical photographic equipment. A highly specialized unit is shown in Figure 10. Such items can be added after the department is established, as the need for extending the program arises. However, by the utilization of this special camera, we have been able to dispense with all of our small size intra- and extra-oral camera equipment. Because the Donaldson stereo camera provides pictures of a size that compares favorably with that of the 35mm slide, we make two exposures of each picture requested. We then mount up the first pair for stereo viewing and bind the first one of the second pair in a standard 2 x 2 slide. We file the second picture in our duplicate file for future reference. Thus we have one camera in place of three, better pictures, and a saving in photographer's time and equipment maintenance.

We are presently exploring the pos-

sibility of having selected stereo lecture material reproduced in a smaller size and made available to the students as a form of 3-dimension color note taking.

The amount of work turned out is summarized in Table I.

AVERAGED YEAR FROM PERIOD 1950-1955		
Photos taken	Color	1429
	B & W	1566
Prints	Contact	1038
	Enlargements	1667
	Mounted	1355
Slides	Color	1411
	B & W	873
Motion Picture Films	Color	7870
	B & W	1200
	Titles	167
Photomicrographs	Color	292
	B & W	255
Artwork Jobs	Lettering	132
	Drawings	157
Ozalid Jobs	Prints	204

Slide Library

It is often debated in educational institutions whether or not the slide library should even be provided, let alone administered by the photographic department. Setting it up and maintaining it requires a great deal of "non-photographic" knowledge. For example, an important feature of the ease with which our slides can be used is a complete catalog. Figure 11 shows a slide with its file card.

The slide library has been justified in 5 ways:

(1) The slides are coded, cataloged, and systematically circulated. A member of the faculty can request slides as needed, or in advance for later delivery, to cover his lectures for an entire school year.

(2) The use records also serve to determine which slides are no longer being withdrawn. This may indicate obsolete content, and they may then be replaced by fresh material.

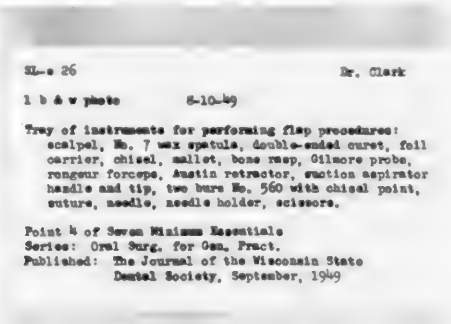
(3) Often in years past when a man left the faculty, all his lecture illustrations in the form of slides went with him: the new man had to build up a new collection. This is no longer true as all slides are the property of the slide library. Each member of the faculty now has the use of a large collection of illustrative material.

(4) The maintenance of the slides is relatively simple. The slide librarian is able to order broken slides replaced and keep each slide in the library in serviceable condition.

(5) Most important of all from an economy standpoint, we have been able to achieve almost complete elimination of duplicate photographic orders con-

Figure 10. Donaldson Stereo camera, a precision unit for recording teaching material in stereo and regular slides.

Figure 11. A card in the file carries a complete description of the slide subject and suggests possible use. It and the slide are coded with a number indicating Division, size, subject, and a series number if needed.



SL-s 26 Dr. Clark

1 b & w photo 8-10-49

Tray of instruments for performing flap procedures: scalpel, No. 7 wax spatula, double-ended curet, foil carrier, chisel, mallet, bone rasp, Gilmore probe, rongeur forceps, Austin retractor, suction aspirator handle and tip, two burs No. 560 with chisel point, suture, needle, needle holder, scissors.

Point 4 of Seven Minimum Essentials
Series: Oral Surg. for Gen. Pract.
Published: The Journal of the Wisconsin State Dental Society, September, 1949

cerning a given patient. Formerly, several divisions of the school could order pictures: very likely they all showed the same condition.

With every subject slide in the library available to the faculty, the Dental Illustration Laboratory is able to turn out more pictures of more patients with no increase in expense or time expended. Of course, all the types of records that will be needed for a patient have to be known and made.

Cine Program

Our motion picture production procedure has evolved into the following six steps, showing the type of work we do:

Script. Representatives of the Dental Illustration Laboratory and the division requesting the film confer to decide whether the film needed is to be a record film or a teaching film. If the film is to be the latter, the level of instruction is also decided upon. A script is then carefully drawn up and submitted to the Dean of the school for budget approval.

Shooting. The camera man is required to familiarize himself thoroughly with the operative procedure he is expected to record. More often than not, this requires him to watch similar operations so that he will know what to expect during each stage of the operation.

Editing. The job of editing, through careful script planning, becomes greatly simplified because of adequate advance preparation. At this stage, titles are added to the motion picture.

Narration. A narration is recorded on magnetic tape which becomes a master recording. Because we use the magnetic sound stripe system with its inherently great simplicity, versatility, and fidelity, we are able to record the operator narrating his own film, thus giving an air of authenticity that is very difficult to accomplish in any other practicable way.

Approval. Each film must receive the general faculty approval. One period each week of the school year is set aside for motion picture previews open to any member of the faculty interested in attending. In this manner the film is not only reviewed by other men familiar with the specialty the film portrays, but it is also checked for presentation by men not as familiar with the specialty as the producer, thereby giving us an idea as to its effectiveness as a teaching film.

Distribution. After a film has received faculty approval, it is then used for classroom teaching and is supplied to members of the faculty for lecture illustration and material for dental society meetings and dental study clubs. Circulation outside the University has already been discussed

ECONOMICS OF THE PROGRAM

There are 4 methods of obtaining photographs to furnish the type of illustration needs presented. They can be purchased commercially; the instructors can make their own; scattered departmental photographic laboratories can attend to specific requirements; or a centralized illustration department can produce them. There are some advantages to all. Recourse to each for certain items is sometimes economical. We lean towards centralization. In addition to the funtions already cited, advice on when to resort to such recourses can be within the scope of an illustration department. The economics should be considered in broad, long-run terms, however.

Outside Sources

Obtaining photographs from suppliers has limitations because they are unable to meet the endless variety of individual needs. A good way to start a photo-

graphic collection is to consider certain available basic items and then build up the specialized aids.

Motion picture producers' costs are geared to commercial styles and budgets, and few institutions can afford to have their teaching film so made. Also, there are numerous occasions for short subjects which would not warrant the time of bringing in a production unit. Motion pictures would cost us about $20,000 a year if ordered outside. This amount alone is greater than the total sum expended for all personnel salaries, new equipment, and supplies for this laboratory for any given year.

Commercial photographers can sometimes be of help for still photographs. Here again, it is difficult for them to be on the spot economically when a given photographic task presents itself, with the resultant loss of valuable teaching material. Also, they do not even pretend to keep competent biological photographers on their staffs. This leads to lengthy, time-consuming explanations by the faculty member to the photographer—often at some inconvenient time. And in a clinical institution, it is virtually impossible to additionally synchronize the presence of patients. Rarely can a commercial establishment afford to invest in specialized equipment like a photognathostatic camera, or even a simple photomicrographic setup. If this is furnished by the University for a special job, it may get little subsequent use because of various barriers.

Costwise, the institution pays for travel time and expenses as well as the photographer's time and studio overhead. Even were specialized equipment installed, there would be a loss in faculty time, and possibly patient expenses, involved in supervising certain aspects of the work. Job orders in the commercial studio must fit production schedules; the school, being but one of the studio's customers, cannot expect rapid service without paying a premium for this service.

Lantern slide prices can vary from $4 to $11 and more each, depending on the studio's job-cost analysis and profit margin. These are typical quoted prices for printing the slide and binding it. If a negative must also be made by the studio, the additional charge for each slide may be from $1 to $5. Motion pictures can average from $2 to $3.50 per finished film foot plus the cost of the instructor's time used in script writing, demonstrating the technic, and editing.

Faculty Photography

Many teachers are photographers. It is good for faculty members to know something about photography because they will then have a better appreciation of story clarity and quality. Also, they know just what pictures will fit their own specific needs. But it is much more economical for them to transmit their ideas to a capable photographer.

If all the teachers had to spend time making photographs, there would be a colossal waste of much-needed "teacher-hours." Also, we must consider cost to the institution in the form of salaries so diverted.

In the following examples of salary contrasts, all figures are averaged to a common base to provide as equitable a comparison as possible. Mean salaries for Civil Service for teachers in Minnesota high schools and State Institutions range from $2.95 to $3.59 per hour.[17] While this is not a point of particular pleasure to the photographer, hourly salaries range from $1.31 to $2.46 under Civil Service rates for photographic personnel.[18] A broader and somewhat higher range of salary, from $1.71 to

$2.72 per hour, exists for the United States Civil Service grades for medical illustrator and medical photographer.[19]

These analyses show that the highest paid biological photographer's average salary is lower than that of the lowest paid science instructor. It is important to remember that the salaries cited are those of instructors teaching science courses in high school and state institutions. In the event an instructor is a surgeon, a dentist, or the chairman of a department in a University, the salary spread between that instructor and the photographer would, of course, be much greater. However, because these salaries vary markedly and are often a matter of individual negotiation, no average for these positions is presented here. It must be remembered that the preceding figures are regional in nature, but have been used because they were readily available to the author. Similar comparisons can be made throughout the country.

The photographer is the low man on the financial totem pole. He can make photographs for less money. Even if we grant that his scale will rise as the worth of his work becomes appreciated, his extensive training in his specialty enables him to obtain the results in less time. If he is proficient, he can certainly also do a better job than one not trained in the art.

Individual Departments

Another method of audio-visual material procurement is through the services of scattered laboratories within the parent institution. These may be a general photographic laboratory, an audio-visual service, and a medical illustration studio. Although, from a direct cost standpoint, this method may seem less expensive than doing business with a commercial studio, the administrator will soon discover that the time factor involved in working with several separate internal departments will negate the lowered price on the journal voucher. Each of these divisions, usually operating under carefully controlled budgets, must confine their equipment purchases to those items adaptable to the greatest number of job situations.

Again, specialized fields like dentistry, with their inherent illustration problems such as small fields, are often somewhat neglected. Experience has shown that although specific job costs are usually reduced when the work is done by institution services, more often than not the administrator will find that his expenditures during the budget year come very close to equalling the cost of such material purchased commercially.

Centralized Service

The fourth, and most reasonable, method in terms of cost economies, availability, and control is an illustration laboratory within the school. A properly equipped, maintained, and efficiently operated laboratory has 8 primary advantages over other methods of audio-visual material procurement. Any one of these advantages could conceivably justify such a laboratory:

(1) Equipment suitable for all illustration needs can be most efficiently utilized.

(2) The administrator retains control of the equipment.

(3) The administrator oversees the laboratory personnel, and thereby controls work quality and quantity as well as production schedules.

(4) The laboratory can be centrally located in regard to departments, thereby affording easy access for faculty members.

(5) Needed immediate services are available from competent photographers.

(6) Efficient utilization of laboratory space eliminates time-consuming equipment setups. *Concluded on page 82*

Plate III. The use of color in slides is important when the recognition of conditions hinges on fine differences in color. This eliminates the burdensome need, on the part of those unfamiliar with the subjects, for making interrupting mental translations from black-and-white illustrations to the colors of actuality. Communication is thereby made clearer, quicker and more permanent. Depicted here are 6 conditions that lead to prosthetic treatment caries, periodontoclasia, malocclusion, trauma, hypoplasia and neoplasia. Made by Irvin H. Ante, D.D.S.; former Professor of Crown and Bridge, Faculty of Dentistry, University of Toronto.

(7) Equipment can be lent to individual departments for operation by their personnel under the guidance of the photographers and then returned for other uses as soon as the project is completed.

(8) The most efficient application of artists' illustration and photography can be apportioned, and the suitability of artwork prepared for photography can be ensured.

The Author hopes that this outline of the considerations involved in producing the enormous quantity of illustrative material needed for efficient teaching and other purposes will prove helpful to those faced with similar needs. The task is a big one but not insurmountable by a long way. It must be done. Never has the old adage "Time is money" been more true. And money wisely spent is time saved.

Often an administrator or instructor from another institution, while inspecting our dental illustration laboratory, will ask, "How can you afford to do all this?" In view of the foregoing factors, we find we must answer his question with another question, "How can you afford not to?"

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Figure 1. (Kent) Layout charts can be simply made and they save much time and errors.

Uses of Photography in the University

FRED W. KENT, FBPA and JAMES A. KENT

Photographic Service,
State University of Iowa

Centralized self-supporting service — efficiency from broad application of basic techniques — university publications and releases — teaching home care — student self-instruction — a working tool — operational details — accounting and costs.

WE believe we can contribute two additional facets to the varied aspects of the general subject of effective visual material discussed in this Symposium. First, our department of 14 and 2 successory university students provides illustration for the entire school rather than for one college. Second, our operation has a free-lance character from a policy of the administration which places all service units on a self-supporting basis. This puts the burden on photography to prove its own merit. A brief discussion of the great variety of our work will be followed by a few of the major operational details. Photography has come to have many functions as well as the production of visual aids.

Types of Work

One of the great advantages of a centralized service is the efficiency with which illustration problems universal to the various colleges can be covered. Knowledge and techniques worked out for one application can often be applied to others. Obvious examples are the numerous office copy items and student notebook inserts, tabular and chart slides, teaching and meeting exhibits, illustrations for graduate theses, television photographs, public and personnel relations prints, infrared procedures and cine film and sound editing. Simply-made teaching layouts, Figure 1, also have similar general possibilities.

It is also easy to appreciate that subjects from very different fields can be photographed with the same equipment and basic manner of working. The photomacrography of the tiny brain stem of a tadpole for biological study (Figure 2) is fundamentally the same problem as that for the medically significant twin human embryos in Figure 5 — or

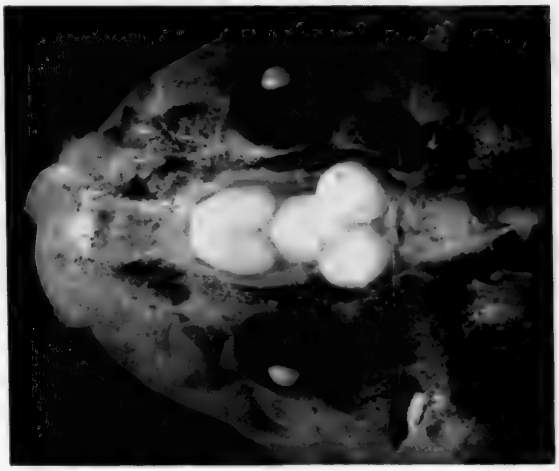


Figure 2. Photomacrography entails similar techniques regardless of subject. It is more efficient to have a single department apply knowledge gained in any one problem than have several learn the tricks as individual needs arise.

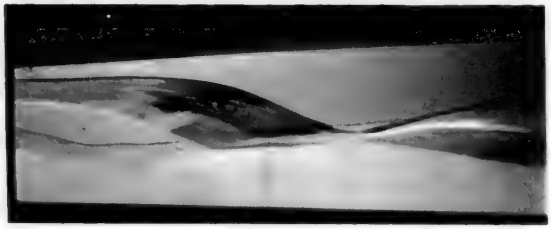


Figure 3. Photographic study of transient wave phenomena.

for a small jewelled bearing in engineering, etc. At the other end of the scale, a large setup is made no different to photograph merely by being located in one laboratory or another.

The less obvious interchange of methods can be typified with an interesting problem in otolaryngology. A research project involved the study of wave movements. We were quite accustomed to the ways for recording such phenomena from experiments in the Hydraulics Laboratory, see Figure 3. Accordingly, we utilized one of their glass-sided channels for this special investigation and attendant photographic analysis.

Dealing with so many individuals, we have to be prepared to make all types of

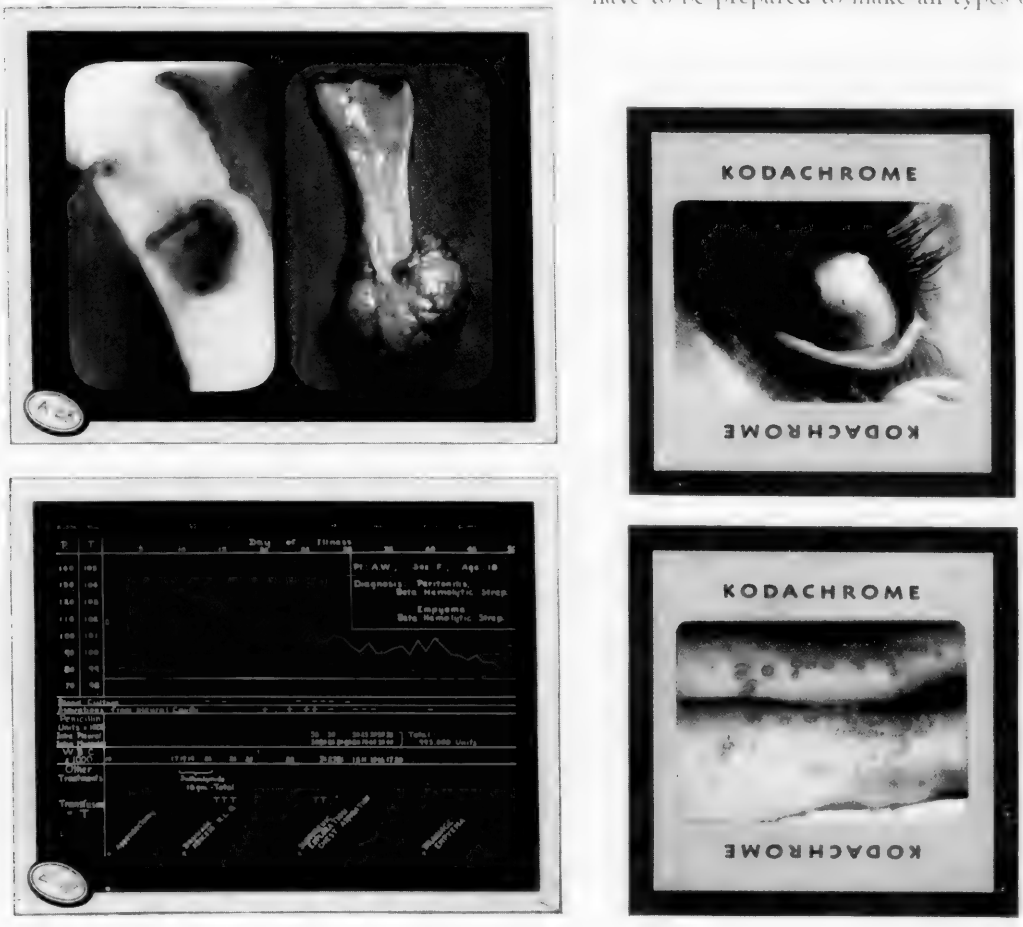


Figure 4. A centralized service must be ready to make slides of any kind for specific requests. Wide experience yields dividends by leading to the most useful way to communicate ideas.

slides, Figure 4, for teaching and lecturing as well as research. Slides for self-teaching are described later.

Other self-teaching aids are in widespread use. These include panels of transparencies in front of illuminators strategically located where students gather, see Figure 5. Stereo slides with

Figure 5. In addition to their prime purposes in teaching, lecturing and publication, slides like these can be duplicated in larger formats for illuminated self-study panels placed in key locations.

recorded discussions and also short motion pictures round out facilities for self-instruction in some fundamentals and review. They can supplement the all-too-brief formal instruction in measures like scrubbing and isolation.

There is a large demand in all the departments for student identification portraits, and we make 10,000 a year. These are used as work-saving recognition aids by the doctors in the College of Medicine, who see each group of students for only 6 weeks per year. The College of Engineering prints a booklet containing notes of introduction for the graduating class and distributes it to prospective employers. A good portrait "illustrates" each reference. Studio photography also provides photos of students and faculty for year books and publicity releases.

Then there are booklets prepared for guiding and recruiting students for specialized fields. For example, Figure 6 shows one of the publications of the Admissions Office. The College of Medicine puts out several multilithed handbooks on home nursing and exercise aimed at parents and nurses to help further adequate care during the post-hospital recovery of patients—a period when the benefits of institutional treatment are often lost. Photographs of the actual patient involved are accompanied by step-by-step instructions. These are particularly valuable for applications like outlining the procedures for handling polio patients in semi-literate families. General booklets are also utilized for pre-operative and post-operative instructions in cases such as those entailing a colostomy. Stereo slides are also often utilized here.

Along these same lines, we have prepared several photographic albums for the libraries of various departments. These are greatly sought after in self-study endeavours. For instance, in the Department of Obstetrics and Gynecology there are albums of pictures dealing with abnormal fetal development and other problems. With each photograph is a typewritten paragraph or two of description. Among similar albums is the extensive "Brace Book" in the Department of Orthopedic Surgery.

Students in the Department of Pathology are given what amounts to individual instruction by means of Kodachrome slides. Each one is assigned a series of histologic and other microscopic slides for study. In addition they are given a set of 2 x 2-inch Kodachrome slides made from these microscopic

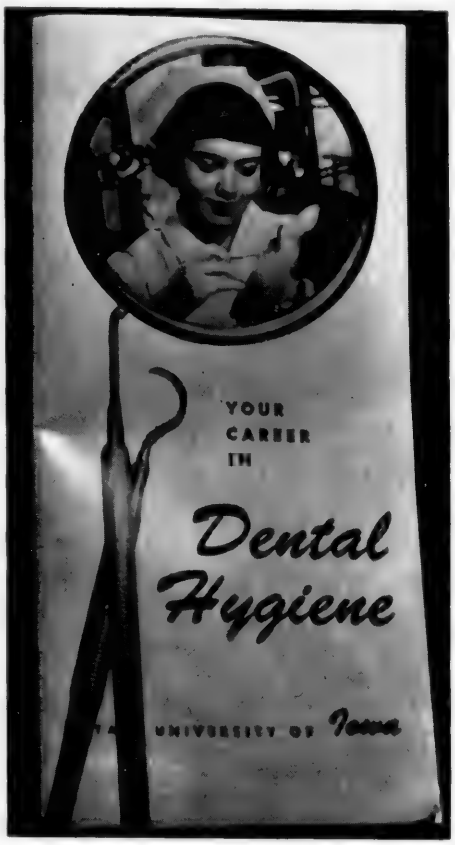


Figure 6. Publications of the institution call for photographs made internally.

slides, which show a typical field in each specimen; corresponding notes accompany each set. The student then projects one of his Kodachrome slides in a darkened tunnel and learns from his notes the significant features it portrays. Thus he doesn't have to hunt all over the slide in the microscope for a pertinent field. Instead, when he has the image well in mind, he can go to his microscope, find the original field, and study it and its relation to the surrounding tissue. Similar facilities in biology, crystallography and metallurgy suggest themselves. They should be designed, of course, to supplement and not supplant actual individual supervision.

Students have the opportunity to select sets of slides or motion pictures of particular interest and have them duplicated. In that way they can acquire a personal collection that might otherwise take a lifetime to build up. Any slides wanted can also be made from currently available cases or significant specimens.

Staff members make extensive use of the actual slides in teaching and lecturing. They have the same opportunity as the students to build up collections from their own and other departments. One resident surgeon had duplicates made of over 4,000 Kodachrome and black-and-white slides, as well as several Kodachrome 16-millimeter motion pictures dealing with urologic surgery.

Sometimes students or faculty members wish to employ their own slides in reports. This can be done by making a black-and-white print, titling it and then copying the result with Kodalith Autoscreen Ortho Film. Small-quantity reproductions are then made by the ozalid process.

Photography as a tool is too well known to warrant cataloging here. Yet a few isolated examples will give some idea of the diversity of our work. We have found the electronic flashlamp most useful in making time-lapse studies of plant life, because its pulses of heat, which accompanies all photographic lighting, are too brief to affect the experiment. Photography as well as radiography can be used for guidance in the operating room; see Figure 7.

Before each rhinoplastic operation in this institution four photographs of the face are made: a straight-front view, two profile views, and a low-front picture to show the nares. They are useful for preliminary study of the case and for

Figure 7. Besides an infrared record for the case history, an enlarged transparency was made for guidance in the operating room and later used in a staff conference.

Figure 8. Photographic "tricks," when used appropriately, can reduce the number of records and also produce a more forceful illustration.

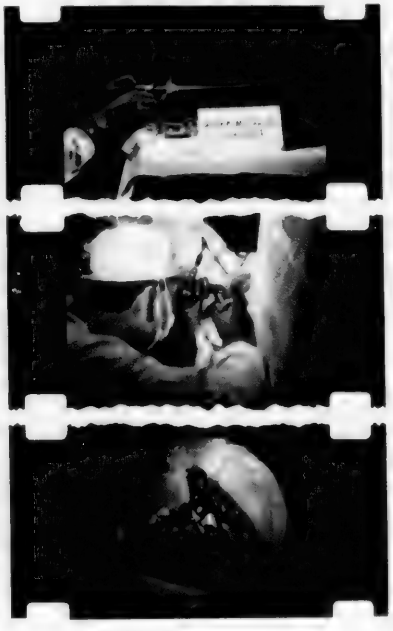
comparison with similar postoperative photographs. Before-and-after profile negatives are often superimposed to provide graphic demonstrations, as in Figure 8.

The keynote of our acceptance by all of many different "customers" is our effort to understand their illustrative goal and our desire to make useful, and sometimes imaginative suggestions (Figures 8 and 9).

The advent of magnetic sound striping has simplified the addition of commentaries for the latter and brought sound films to a stage of practicality for most applications.

We even use photography as a tool for expediting accurate photography.

Figure 9. This cine film clip dealt not only with use of the instrument but also clearly portrayed its manipulation and action within a bladder gross specimen. To graphically state the fact that this gallbladder was a re-formed organ it was photographed beside stones and preserved specimen subtotally removed 22 years previously.



We have prepared photographic prints to serve as a guide to positioning patients for routine views. One instance depicts the standard positions for the hands in orthopedic study. By microphotography we have also produced field-finder micro-slides for wide distribution to those who order photomicrographs from us. They are particularly easy to use by instructor and photographer because they bear some 600 finely lined squares that are simply numbered in order.

Probably our most bizarre application of photography came when we used the camera to spot a high-voltage leak in an electrical laboratory. It was too dangerous to allow a human searcher in the room. But the break-down in the insulation was safely and readily detected by leaving a camera, with open shutter, in the location while the voltage was applied for a short period. See Figure 10.

Operational Details

Our service can best be described as a centralized photographic unit with an "open door" availability to everybody on campus. There are no prior claims to our time—no preferred customers; but there are types of work which order our scheduling. This implies adjustments and rush periods which we can anticipate and then hire extra part-time help.

Our function is not confined to the production of photographic products alone, but includes advisory service to departments and individuals. It means we act in a consulting capacity for students, faculty, and at times the purchasing agent. The salary of the manager is subsidized expressly for the advisory benefit to those who need photographic help, whereas other costs are covered by our charges. Today it is especially intriguing to keep "up to date" because photography is expanding into new fields with new methods of reproduction and new products. We feel that our wider field of operation, the whole university, gives us a chance to exercise a real operating versatility and economy in photography.

The State University of Iowa is large and covers several square miles. The College of Medicine includes four hospitals and a research building. In order for our photographers to adequately service the University Hospitals we have an area in the main hospital for camera work. In a centralized laboratory, acting as a home base, is done all the necessary processing and finishing. Our facility is large and is supplied with up-to-date equipment. We have a business office, file room, an office for the manager, camera equipment room, a studio for portraits, a copy room, slide binding room, and a finishing and editing area. There are rooms for film processing in color and another for black-and-white film. Printing and enlarging are done in one department and there is a separate color printing room. Space is devoted to storage and air conditioning.

Our personnel consists of a manager, a group of seven photographers, three secretaries and three medical artists. We also use two students to help each

Figure 10. An unattended camera in this dangerous situation located a high-voltage leak.

school year and throughout the summer.

In order to be effective as a centralized service, we have divided responsibilities. Our medical photographer does all the medical photography; one of our laboratory men does printing and enlarging; another carries out the copying and slide making; and still another makes the news pictures. An assistant manager sees that each gets help when needed. We use two good students to help with film processing and color processing. The secretaries do the office-work, type orders, and file negatives. One deals mainly with the medical work; another sometimes helps with the finishing. The artists prepare the drawings and charts and design exhibits. They letter most of the captions, but some of this for expendable internal use is done with a typewriter. On occasion they make layouts for the publications mentioned.

The assistant manager handles most of the non-medical assignments not mentioned above. He supervises good portrait lighting. It is also his duty to see that every job requested is completed when needed. Our doctors and faculty have come to trust us to help them obtain necessary pictures and slides when they need them. We know that when they are in a rush we have to try to meet their deadline if at all possible.

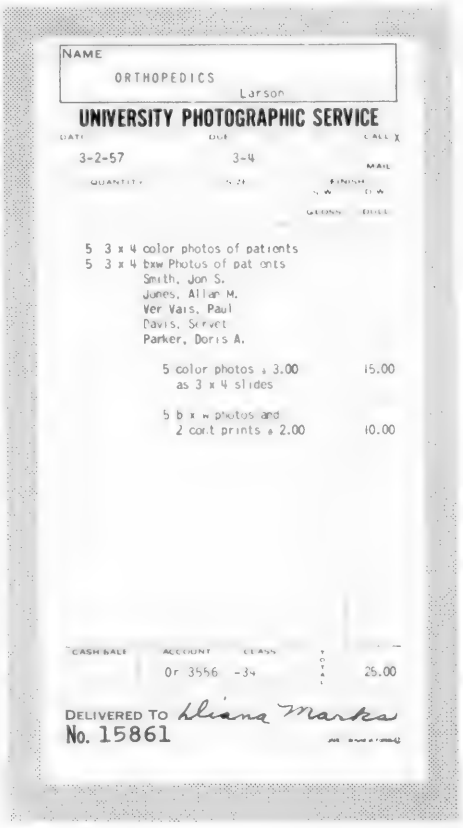
While our organization is centralized, there are applications which, for efficiency, are best serviced by departmental personnel. The need for photographs is sometimes immediate, or part of a departmental routine, or faculty members would find it difficult waiting to be on hand for a photographer to arrive for instructions on every record. We help them to arrange practical photographic or photomicrographic setups. Sometimes we design special equipment for them.

Accounting

We are primarily photographers, not experts in accounting. We need simple but accurate methods for figuring costs and charges. We do not try to make a profit for the service. To reduce overhead from the bookkeeping factor, we have minimized paper work with a simple multipurpose form. It serves to order and record work done, to provide a billing and a receipt. Figure 11 depicts the sheet; carbons produce a triplicate record, the last being on a thin card for permanent filing.

The Business Office of the University gives us monthly reports from this data.

Figure 11. Multipurpose form used in our record-keeping and billing.



NAME
ORTHOPEDICS
Larson

UNIVERSITY PHOTOGRAPHIC SERVICE

DATE 3-2-57 DUE 3-4 CALL X MAIL

QUANTITY FINISH B & W COLOR GLOSS DULL

5 3 x 4 color photos of patients
5 3 x 4 bxw Photos of pat ents
Smith, Jon S.
Jones, Allan M.
Ver Vais, Paul
Davis, Servet
Parker, Doris A.

5 color photos @ 3.00 as 3 x 4 slides 15.00

5 b x w photos and 2 cont prints @ 2.00 10.00

CASH SALE ACCOUNT Or 3556 -34 CLASS 25.00

DELIVERED TO Liana Marks
No. 15861

TABLE I — STATE UNIVERSITY OF IOWA PHOTOGRAPHIC SERVICE, COST ANALYSIS, 1956

Camera Work	Salaries & Wages 01-02	Operating Costs 21-31	Material Costs 41-53	Equipment Amortization 61-73	Overhead Dist. on Pro. Cost	Total Cost	Units	Unit Cost
Location Pict. (med.)	$9,969.30	$414.70	$1,854.94	$1,504.88	$2,865.32	$16,609.14	9,107	$1.8238
Studio (Portraits)		970.26	635.72	123.50	267.73	1,997.21	5,430	.3678
Copy Photography	4,023.38	16.13	2,018.44	147.53	1,114.65	7,320.13	17,964	.4075
Motion Pictures		22.07	5.51	17.76	6.09	51.43	707	.0727
Identification Pict.	785.92	73.57	126.59	36.29	237.16	1,259.53	11,538	.1092
Laboratory Work								
Enlarging-Printing	4,859.48	404.58	3,545.92	299.42	1,452.55	10,561.95	67,808	.1558
Ozalid	575.32	132.53	1,002.96	125.00	195.32	2,031.13	18,128	.1120
Slide Binding	1,351.74	5.46	987.91	66.48	374.50	2,786.09	12,696	.2194
Film Processing	1,601.14	345.65	100.37	13.50	537.19	2,597.85	23,548	.1103
Color Processing	703.62	98.60	69.86	10.84	221.36	1,104.28	2,311	.4778
Microfilm			156.08			156.08	12,245	.0127
Medical Illustration	13,139.69	64.67	624.59	59.33	3,643.56	17,531.84*		
Overhead	6,650.33	3,548.79	111.24	605.07	10,915.43**			
TOTAL	$43,659.92	$6,097.01	$11,240.13		$3,009.60	$64,006.66		

*Total Income of Medical Artist	$ 9,688.35
Less Expense of Medical Artist	$17,531.84
Artists Net Loss:	$ 7,843.49

**Add Resale Of Supplies	$ 8,792.39
New Equipment	$ 949.01
Total Expenditures	$70,738.46
Gross Income	$75,261.28
Photography Net Gain	$ 4,522.82

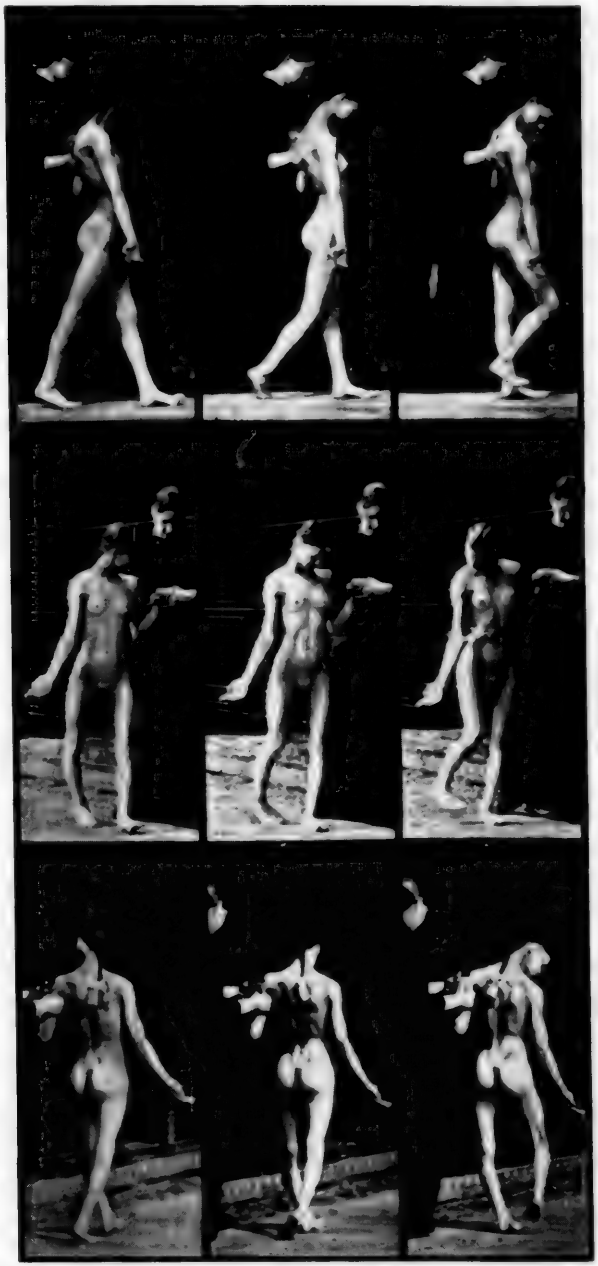
TABLE II — 1956 PRODUCTION, MEDICAL PHOTOGRAPHY

	ENLARGEMENT	CASE RECORD	CONTACT PRINT	SLIDE 3 x 4 B & W	SLIDE 3 x 4 COLOR	SLIDE 2 x 2 COLOR	CINE FILM, FEET	OZALID
Anatomy	13	....	475	93	12	53	....	....
Anaesthesiology	19	....	86	36	5	7	....	....
Bacteriology	142	....	230	83	60	....	....	600
Biochemistry	1	....	203	38	....	2	....	....
Hygiene and Preventive Medicine	....	....	56	47	....	91	....	50
Pathology	22	....	284	21	180	....	....	24
Pharmacology	7	....	133	110	4	....	....	....
Physiology	10	....	328	107	....	....	....	100
Radiology	50	....	246	197	14	11	....	....
Medicine	370	44	1319	413	203	2	792	850
Neurology	81	12	255	138	62	162	375	....
Obstetrics and Gynecology	73	2	302	213	46	13	....	....
Ophthamology	70	53	688	269	18	55	3340	50
Otolaryngology	360	1688	1934	182	189	258	8055	....
Orthopedics	357	632	1495	153	145	234	170	90
Pediatrics	18	249	173	27	5	....	....	....
Neurosurgery	146	90	1008	164	73	26	1730	....
Surgery	685	119	1774	333	369	165	2818	210
Urology	260	1	1551	273	173	....	100	....
Psychopathic Hospital	....	....	563	15	....	9	....	....
Hospital Administration	....	....	147	88	2	151	....	1277
Medical Administration	14	....	124	6	....	....	....	....

This report shows us: salaries and wages, material costs, miscellaneous expenses, new equipment, number of photo products and average cost of each type, Table I. Costs and receipts show monthly gain or loss. Analyses of use reveal that medical photography comprises 43 percent of our work, other university assignments 28 percent and student orders 29 percent.

Table II shows a typical yearly production for various medical departments. As an example of average costs, medical photographs run as follows: camera work $1.83 each record; binding slide $0.22; print $0.16; and copy negative $0.41.

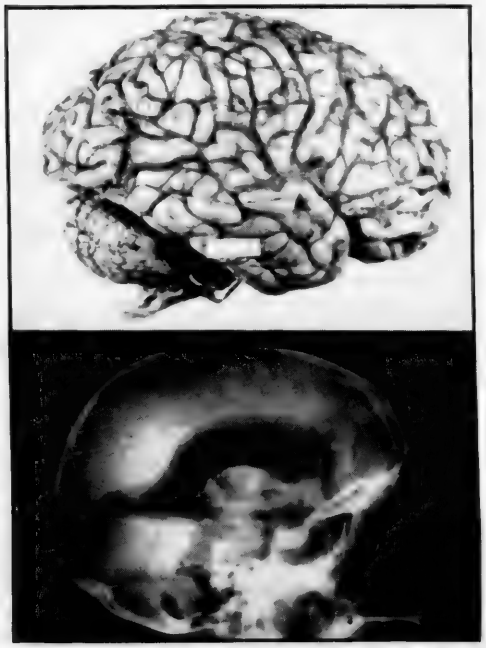
This discussion will show that a photographic service becomes indispensable in a large teaching unit. Others on this Symposium have dealt with the reasons for this. We hope we have contributed by showing that the very existence of our extensive operation demonstrates the need.

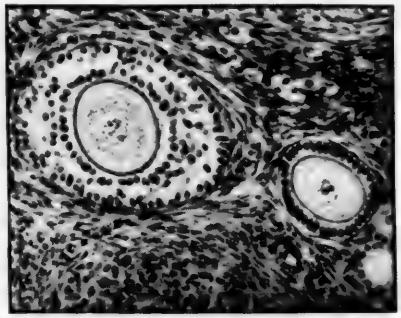


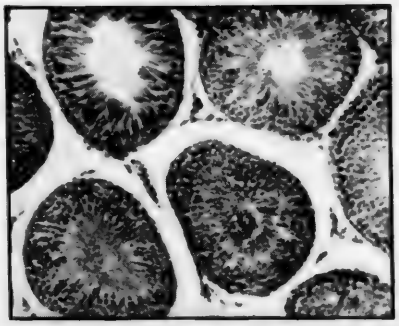
As early as 1883 the University of Pennsylvania became probably the first institution to put a research photographer on its staff. He was Muybridge, who, on September 25, 1885, produced this orthopedic study that would be still useful today. He employed 3 banks of 8 cameras to record chronometrically 3 serial views of patients against a 120-foot outdoor background. Techniques have changed radically over the years but there is no need to change basic applications — just to expand them.

PHOTOGRAPHS BY BPA MEMBERS

The subjects of biological photography are varied, and the types in any one field numerous. In the Medical Photographic Department applications go beyond the mere recording of pathology photomicrographically, grossly and clinically. While this is the main technical activity the purpose is communication of facts and relationships. Reproduced here are: *Schizophrenia*, B. B. Varian; *Ovary, with Developing Ovum and Testis*, E. V. Wilmott; *Radar*, Zane H. Price; *Dynamics of a Sneeze*, Marshall W. Jennison; *Deforming Arthritis*, Charles G. Reiner; *Normal Control*, Leonard T. Pimental; *Student Chorus*, John E. Withee; *Threading Needle*, Gabriel Evancy.







Journal of the Biological Photographic Association Vol. 25, Nos. 1 and 2 February-May, 1957

Neuropsychiatric Photography*

F. D. WALLACE

Chief, Medical Illustration Service,
Veterans Administration Hospital, Lexington, Kentucky

Photography for detailed repetitive study — studio precautions — concealed spontaneous filming — use of fast films.

MOTION picture photography is a most useful tool for psychiatric research. It provides a means that would be hardly accessible, without filming techniques, for collecting data and assembling demonstrations in an area of great importance for psychiatry. The consideration of excessive behavior is often a decisive step in the clinical evaluation of patients. Like a spoken word which eludes detailed analysis if not immediately evaluated, expressive movements may escape detailed study and significant description without repeated recourse to motion picture photography for recreating them. Accordingly, for the past seven years cinemaphotography has had an invaluable function in the neuropsychiatric hospital for Veterans in Lexington, Kentucky.

Photography of the mentally ill presents many special problems. We are dealing with people who are sick. Some psychotics are quite unpredictable; they may strike out in a sudden attack or surprise us with a suicide attempt. There can be no script followed, there is no rehearsing, the action unfolds according to the sometimes unpredictable mood of the patient. Even if a rehearsal were feasible, it would not be wanted, for we are interested in the spontaneous movements, not ability as an actor.

In as much as photography sometimes creates an artificial atmosphere modifying natural behavior, it may interfere with its own task. A patient studied for his unusual display of mannerisms, may not show them in the studio. When lights and camera would disrupt spontaneity, records can be made in the ward, swimming pool, dining room, corridors, or gym to supplement the film taken in the laboratory. Such versatility adds to the scope of the application.

Each formal or informal setting brings its own technical problems. The best approach is to minimize from the beginning the effects of photography on the patient. In the studio, an even illumination is used, with no light being focused or spotlighted directly on the patient. To elicit reactions and to obtain material for comparison, a simple program of tasks is necessary. Actions, such as tying a tie, working a puzzle, pitching a ball, drawing a picture, give the patient something to do. One objective is to hold his attention in order to remove self-conciousness before the camera. The patient may be asked to memorize some numbers and then to write them down on a blackboard at the far end of the laboratory. With his attention absorbed by the numbers, his walking to the board offers the opportunity to study

*Editors Note: In arranging our Symposium, many worthwhile applications of biological photography were considered. Naturally, it was not practical to present them all—nor is it feasible to cover them all here. Nevertheless, it was felt that the following item, which was made available to us, would be valuable in making the topics of this Monograph as widespread as possible. It may suggest similar research or other types of photographic interview.

his gait as it is in every day life. The photographer, avoiding abrupt movements and reducing noise, should try to make himself as little noticed as possible. He should be alert and ready at all times. It may happen that during the interval between tasks the patient will show some of the most significant behavior. This will add immeasurably to the completeness of the record.

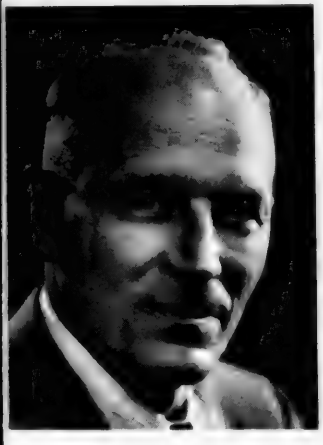
It is possible to obtain the utmost in spontaneity by filming away from the studio. Inconspicuous or camouflaged photographic setups are feasible and the use of fast films makes photography possible in the average well-lighted room. Thus, with a combination of varied records, it is possible to produce full documentation for the application.

Straus, Erwin W.: Rheoscopic Study of Expression. *Amer. Jour. of Psychiatry*, 108, 439-443, 1951.

Straus, Erwin W.: Pseudoreversibility of Catatonic Stupor. *Amer. Jour. of Psychiatry*, 111, 680-685, 1955.

Wallace, Francis D.: Making Motion Pictures of Neuropsychiatric Patients. Presented at the 26th Annual Meeting of the Biological Photographic Association, Eastman House, Dryden Theatre, Rochester, New York, 1956; (to be published in Jour. BPA).

OUR NEXT EDITOR



It is safe to say that all relatively small scientific and academic societies like ours experiences the vicissitudes of publishing a journal. The editorship demands a lot of personal time and ability of a special kind. The BPA is fortunate that Leo C. Massopust is in a position to accept the post of Editor.

This is particularly true in view of the fine editorial years he has already served from 1938 to 1949. He is also our next President. He needs no introduction to our older members. But our Association has grown so much over the last few years that we would like our newer members to know him better.

Leo is Director of the Department of Art and Photography at the Marquette University School of Medicine, Milwaukee, Wisconsin. He has helped develop infrared photography there, particularly in medicine, and has written nearly three dozen technical articles on medical photography.

With the late Eben Carey, M.D., then Dean of the School of Medicine, Leo won the gold medal at the annual meeting of the American Medical Association in 1942 with an exhibit of 150 color photomicrographs of nerve end plates. This medal is the highest award granted to exhibitors.

He was born at Green Bay, Wisconsin, in 1893, and attended grade and high schools there. In 1910 he moved to Milwaukee to take courses in the fine arts at the Wisconsin School of Art, and the Wisconsin State Teacher's College. He also studied privately under several well-known artists. He later gave up a successful studio project to study at the Pennsylvania Academy of Fine Arts. In 1917 he joined the newly formed Marquette Medical School as a medical artist. He soon enthusiastically adopted photography as a means for communicating scientific information and for anatomical and scientific research. He has taken many biomedical courses at the University and also taught there.

It was in 1933 that Leo began working with the Eastman Kodak Company in the development of applications for infrared plates and film. As time went on he found many uses for infrared photography in medicine. One of his later researches, in collaboration with Weston Gardner, M.D., was its aid in the detection of breast cancer. They have shown that the pattern of superficial blood vessels in the breast changes significantly as malignancies develop.

His experience as educator, photographer, writer and artist and his training at the medical school in anatomy, pathology, histology and radiography all have helped him achieve eminence. With such a background we can look forward to many worthwhile issues.

Product Data

MEYER PRIMOTAR F/3.5, 135mm TELEPHOTO LENS FOR EXAKTA

Photographers who require a telephoto lens of large aperture for color, and for dimly lit subjects and action pictures, will find the Meyer Primotar F/3.5, 135mm Telephoto lens useful. Meyer has created this new, 4-element fast-speed telephoto lens for the Exakta camera. Combining excellent resolving power and high color correction with an angle of view of 18°, the Primotar possesses unusual qualities for its high speed and long focal length. Negatives sharp enough for huge blow-ups and salon-quality prints with adequate color correction are possible with this new lens. The diaphragm of the Primotar has 9 settings . . . f/3.5, 4, 4.5, 5.6, 6.3, 8, 11, 16 and 22. The distance scale focuses from infinity down to 5.2 feet. An engraved depth-of-field indicator is provided on the chrome lens mount. Weighing 16 ounces, the 135mm Primotar measures only 5 inches in over-all length, and takes series 7 adapters and filters. Price: $89.50. For more information, please write to Exakta Camera Company, Bronxville, N.Y.

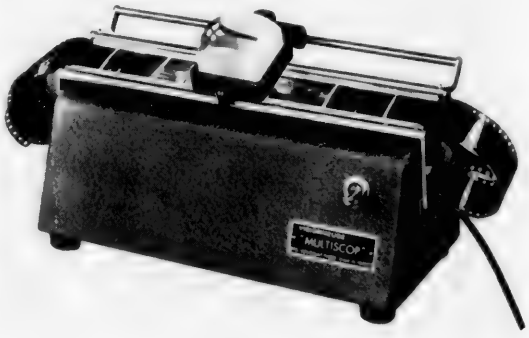
MULTISCOP TABLE VIEWER

This Compact (9¼"x5"x7") Combination table viewer allows rapid and convenient daylight inspection of both mounted 2x2 or Stereo transparencies, uncut 35mm filmstrips, and negatives. You can simultaneously examine six 35mm double frames, four pairs of stereo frames, 12 single frames, etc. A large magnifying lens glides freely across the entire viewing area for careful study of details in any particular frame. The lighting system, built into a sturdy metal housing, consists of a tubular 25-watt lamp, internal reflector and an "opalin" glass viewing surface. Extendible legs permit viewing in either a horizontal or sloped position. The Multiscope is equally suitable for the photo shop, laboratory, studio and visual-aid department, as well as for the amateur photographer. Price: $49.50. For further information write to Karl HEITZ, Inc., 480 Lexington Ave., New York 17, N.Y.

KODAK MAGNETIC-OPTICAL PROJECTOR

The Kodascope Pageant Sound Projector, Magnetic-Optical Model, permits the addition of background narration and music to 16mm films without special equipment or studio facilities. It adds a third dimension — that of sound — to informational, training and technical films made in laboratory, hospital, school or industrial illustration departments.

Because the magnetic-optical sound track can be erased and re-used time and time



again, the projector simplifies the process of producing different sound tracks to run with the same footage. For example, while one audience requires narration of a film in technical terms, another group may need elementary explanation of the same film. It's a simple matter to erase one script and replace it with another. In the same way, film may be adapted to different language groups through the flexibility of the magnetic sound track.

The Pageant Magnetic-Optical Projector provides excellent sound quality from all types of films — new or old, in color or black-and-white, single- and double-perforated, or bearing a conventional optical track. Striping costs approximately 2½ cents a foot. The projector is designed so that a record player, tape recorder, or other sound source can be plugged into it for direct recording. Background music and narration thus can be recorded at the same time or separately. Simultaneous recording is made possible by independent volume controls with adjustable "stops" which can be pre-set for the minimum and maximum volume desired. They are a part of a "built-in mixer" system.

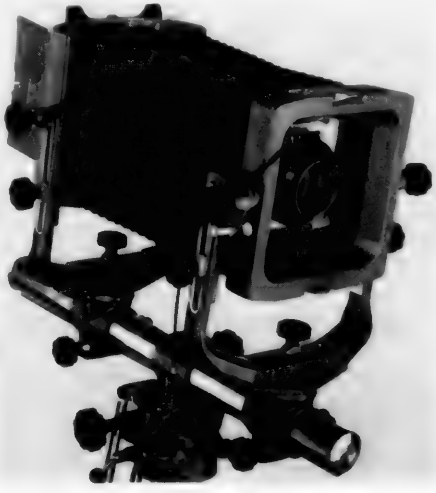
The projector has a lock with removable key to prevent accidental erasing of the sound track. An additional safeguard is provided by a red warning light which goes on automatically when the projector is erasing and recording. The reel arms are attached to the projector and fold for storage without removing belts. It has an 8-inch speaker in a lift-off baffle cover and, like all Pageant projectors, is prelubricated. Price of the projector is $850 list. It is available from Kodak dealers.

LINHOF KARDAN-COLOR VIEW CAMERAS

The Linhof Kardan-Color cameras, an entirely new series of all-metal 5x7 and 8x10 view cameras, have just been introduced to the U.S. market by Kling Photo Corporation, New York, distributor for Linhof Precision Camera Works, Munich, West Germany. Designed on the optical bench principle and 'add-a-unit' system, Kardan-Color cameras provide the professional photographer or studio with every facility to cope with any photographic problem in any field. Complete interchangeability of monorails, bellows, standards, lenses, and camera backs permits building up or reducing the camera length to the unit desired for any given situation.

The basic Kardan-Color camera consists of a 2-inch diameter ground, polished, and chrome plated tubular steel monorail, a front standard, interchangeable bellows, and back standard with ground glass spring back for 5x7 or 8x10 holders. The front and back standards may be tilted, shifted, swung, raised or lowered to the absolute limits of lens covering.

The Kardan-Color 5x7 Duplex Camera is priced at $425.00 and consists of 24" monorail with front and back standard, one long bellows, and tripod mount. The 8x10 Duplex, with conical bellows, is $695.00. A Conversion Outfit to expand the 5x7 or 8x10 Duplex camera to a Triplex model, provides a 39" monorail, intermediate bellows support standard, and additional square bellows section, for $155.00. The Kardan-Color camera is available through authorized Linhof dealers.



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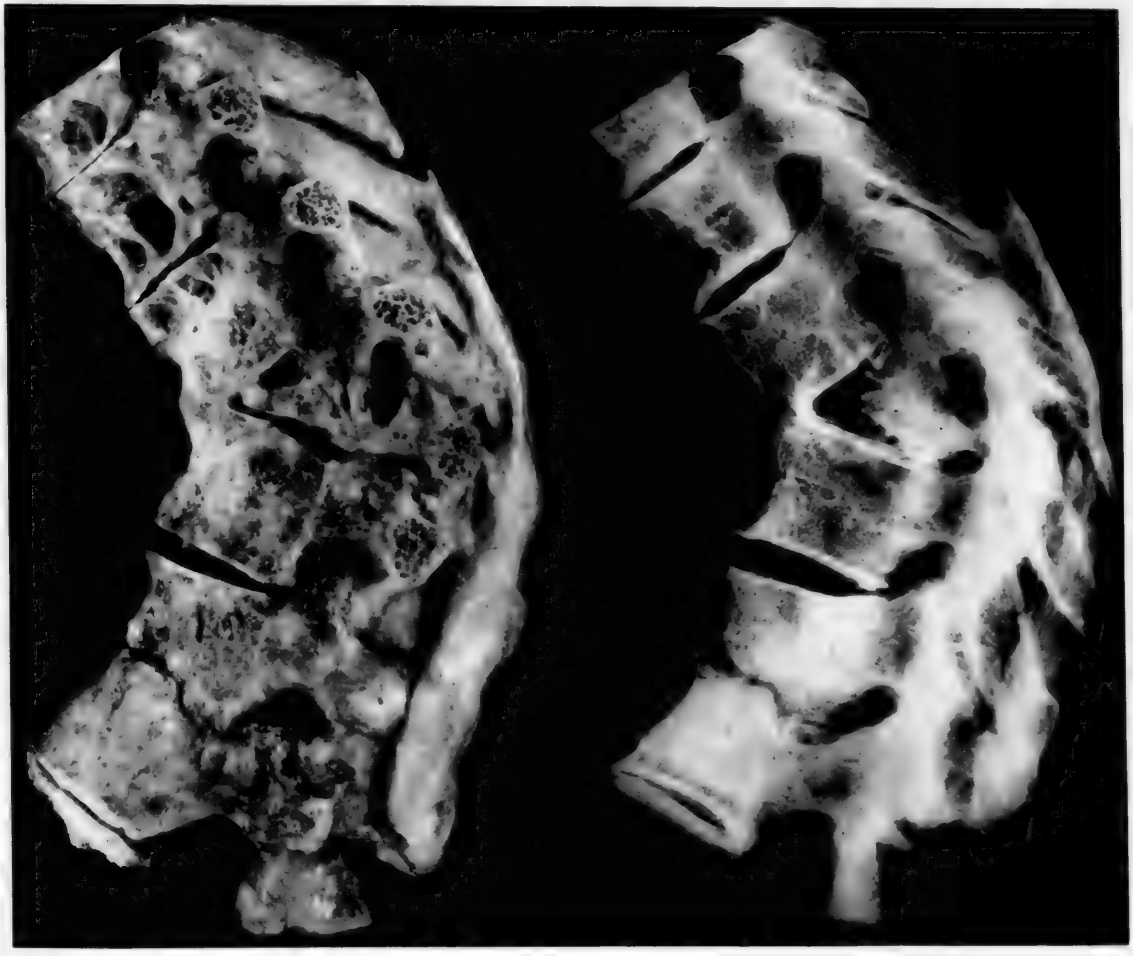

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Members may propose for Fellowship in the BPA other members whom they consider worthy of recognition. To be eligible for Fellowship a candidate must have been a member of the Association for five consecutive years and must possess one or more of the following qualifications:

Superior craftsmanship in still or motion picture photography of biological subjects.

Ability in photographic research in new methods or materials.

(These require submission of evidence.)

Meritorious contributions to biological photography overall through sustained organizational work.

Two sponsors are required. The sponsors should be well acquainted with the candidate's work and ready to furnish the Board with details of his experience and achievements. Those who wish to sponsor a member whom they believe to be eligible should request a Fellowship Application form from the Secretary of the Fellowship Committee: Mrs. Maria Ikenberg, University of Illinois, 904 W. Adams Street, Chicago 7, Illinois.

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